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APPLICATION OF GOODNESS OF FIT TESTS TO MENDELIAN CLASS FREQUENCIES.

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In considering Mendelian ratios from F_2 progenies and succeeding generations with a view to establishing the number of genetic factors involved, it is a common practice, especially when the number of individuals in each family is relatively small, to summate the numbers occurring in each phenotypic class in all of the families and to formulate an hypothesis on the basis of the ratio thus obtained. The observed numbers in each class are then compared with the expected frequency and a goodness of fit obtained from this comparison. Such a method may be the logical procedure to adopt in evolving a working hypothesis but it is manifestly open to criticism as a crucial test of the validity of an hypothesis to account for the results.

It is obvious that the total class frequencies obtained by summation are composite results which may easily mask a serious lack of consistency in the numerical ratios of the separate families, with respect to agreement with expectation. To summate the numbers in each class of all progenies is to rely essentially on mean values, thereby disregarding the deviations from the ratio expected to occur in each family. If the numbers in each family were sufficiently large, little difficulty would be experienced in arriving at the probable ratios as indicated by the class frequencies. With relatively small numbers, special consideration must be given to the deviations from expectation occurring in each family and also to the classification of families according to the ratios which their class frequencies most nearly approach. The smaller the number in each progeny, the greater the chance for the investigator to err if summations are taken as an indication of genetic constitution. Where results are available from a number of relatively small families, a goodness of fit test is required which involves in its calculation the deviations from expectation for each class of every progeny. Such a test of agreement between observation and hypothesis is provided by an application of the χ^2 distribution.

The form of distribution of χ^2 was established by Pearson in 1900 and a table was prepared by Elderton giving the values of P, the probability that a deviation as great or greater than the observed may be expected on the basis of random sampling, corresponding to each integral value of χ^2 from 1 to 30 and thence by tens to 70. Elderton's table is available in Pearson's "Tables for Statisticians and Biometricians" *(4)*. A new table in a very convenient form

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has been published also by Fisher (*2*). The application of the χ^2 method to Mendelian results in the case of polyhybrid ratios of single segregating progenies was suggested by Harris (*3*) in 1912.

Fisher (*2*) has recently published (1925) an excellent monograph of statistical methods for research workers in which numerous applications of the χ^2 method to the results of biological enquiry are explained and illustrated. Valuable suggestions contained in his monograph have been freely used by the writers and are gratefully acknowledged.

In order to illustrate the application of the χ^2 method of goodness of fit to Mendelian results and also to show the necessity for adequate tests of agreement, some data from breeding experiments with sweet clover have been selected. Data recently published by Elders (*1*), give the numbers of normal and dwarf sweet clover plants, when progenies were grown from F_1 hybrids which had been artificially self-pollinated. The numbers obtained by summating the talls and the dwarfs were 110 talls and 45 dwarfs this being considered a good fit to a 3 to 1 ratio. From these results it was concluded that dwarf was a simple recessive which differed genetically from normal sweet clover in a single factor. Table 1 gives the observed class frequencies for the seven F_2 families of sweet clover from Elder's data and sets forth in detail a method of comparing the observed with the expected frequencies by making use of the χ^2 distribution.

TABLE 1.—*Test of agreement between observed and expected class frequencies applied to seven F_2 families of sweet clover on the hypothesis of a 3 to 1 Mendelian segregation for tall and dwarf growth habit respectively.*

No. of Culture	Observed O	Expected C	O-C	$(O-C)^2$	$\frac{(O-C)^2}{C}$
6	15	15.75	.75	.5625	.03571
	6	5.25	.75	.5625	.10714
7	19	17.25	1.75	3.0625	.17754
	4	5.75	1.75	3.0625	.53261
11	14	17.25	3.25	10.5625	.61232
	9	5.75	3.25	10.5625	1.83696
12	11	12.75	1.75	3.0625	.24020
	6	4.25	1.75	3.0625	.72059
14	2	4.50	2.50	6.2500	1.38889
	4	1.50	2.50	6.2500	4.16667
16	31	27.00	4.00	16.0000	.59259
	5	9.00	4.00	16.0000	1.77777
36	18	21.75	3.75	14.0625	.64655
	11	7.25	3.75	14.0625	1.93966

$X^2 = 14.77520$ $n = 7$ $P = .04$

The test of agreement as applied in Table 1 shows χ^2 to be 14.78. In this example n=7 since only 7 entries can be made arbitrarily. For these values the χ^2 table shows that P is approximately .04 which means that a deviation as great or greater than the observed could be expected only once out of 25 trials on the basis of random sampling. We may say, therefore, that in this case the deviation from expectation was fairly significant and that further substantiation of the hypothesis is desirable.

Another example taken from a paper recently published by Smith (*5*) will serve to emphasize the need for more careful statistical analysis of data obtained from breeding experiments. Ninety-one families were grown in F_2 from a cross between annual and biennial sweet clover and it was concluded that the annual growth habit is dependent on a single factor difference. Smith's data are given in Table 2.

TABLE 2.—*Ratios listed according to culture, number, annuals recorded in column A, and biennials in column a.*

Culture	A	a	Culture	A	a	Culture	A	a
4–3	18	6	4–133	18	4	5–75	18	7
4–11	33	7	4–138	12	2	5–76	19	5
4–14	38	12	4–139	16	5	5–79	47	8
4–15	19	5	4–143	11	2	5–80	8	7
4–16	39	7	4–144	15	3	5–81	18	3
4–21	30	6	5–1	13	2	5–82	8	8
4–22	22	17	5–16	17	5	5–83	3	6
4–25	33	6	5–17	10	5	5–87	8	2
4–29	30	8	5–24	6	2	5–88	13	6
4–30	37	4	5–25	17	1	5–89	10	8
4–32	31	13	5–26	11	5	5–90	7	4
4–34	22	3	5–27	11	2	5–91	8	2
4–37	33	1	5–28	7	2	5–92	25	10
4–39	20	5	5–29	6	1	5–93	10	1
4–20	27	5	5–30	10	2	5–94	10	12
4–21	28	3	5–31	16	3	5–101	10	2
4–43	5	1	5–32	7	9	5–102	7	3
4–45	28	1	5–33	13	3	5–103	10	2
4–47	31	14	5–34	4	4	5–105	7	4
4–48	53	10	5–35	5	4	5–106	10	3
4–50	30	6	5–37	41	2	5–107	15	18
4–86	10	1	5–38	14	2	5–108	9	4
4–90	32	2	5–41	6	4	5–109	26	6
4–98	18	4	5–63	31	8	5–110	18	8
4–103	18	5	5–64	5	3	5–111	5	3
4–104	21	3	5–65	19	9	Total	1,563	479
4–107	14	3	5–66	4	3			
4–108	21	4	5–69	10	7			
4–113	30	23	5–70	7	3			
4–124	5	5	5–71	6	7			
4–126	17	2	5–72	10	5			
4–128	20	4	5–73	10	8			
4–130	21	2	5–74	12	12			

The following quotation from Smith's article gives the results which he obtained and a statement of his conclusions:

"A total of 2042 individuals in cultures segregating for the annual versus the biennial character have been observed; of these, 1563 were annuals and 479 were biennials. The deviation from the theoretical 3 to 1 ratio is only 1.7 times the probable error. The significant 3 to 1 ratio obtained means that the difference in habits of growth between annual and biennial sweet clover is due to a single gene difference in the germ plasms of the two varieties".

It will be observed that the test of agreement is applied to the totals obtained by summating the numbers of annual and of biennial plants for all of the 91 progenies. A perusal of the data, however, showed that a considerable number of the different families of plants exhibited wide deviations

from 3 to 1 expectation. Another fact worthy of note is that one culture consisting of 38 families gave 32 minus deviations while the other culture consisting of 53 families gave 30 plus deviations. All of which suggest the inadvisability of basing conclusions on totals and emphasizes the need for a crucial test which will involve the deviations from expectation for each of the progenies and which will give a measure of the consistency of their performance as a whole.

If the χ^2 test is applied to Smith's data as was done in the example given above (Elder's data) it will be found to have a value of 198.87. The table of χ^2 includes consecutive values of n only up to 30. Fisher points out that for larger values of n, the expression $\sqrt{2\chi^2} - \sqrt{2n-1}$ may be used as a normal deviate with unit standard error, since for values of n larger than 30 the distribution of χ^2 becomes nearly normal. Here n = 91. Substituting in the formula we have $\sqrt{2 \times 198.87} - \sqrt{(2 \times 91) - 1}$ = 6.5. The deviation in the case of Smith's data is therefore, 6.5 times the standard deviation and the odds are enormous that the departure from expectation is significant.

The agreement between the observed ratios for the individual families with that expected on the basis of a given genetic hypothesis may also be tested in the following manner. The χ^2 test may be applied to each individual family and then with a large number of values of χ^2 available, the observed distribution of χ^2 obtained from the individual families may be compared with expectation on the basis of a χ^2 test. This is done by distributing the observed values of χ^2 among the classes bounded by values given in the χ^2 table and the χ^2 method used to test the agreement between observed and expected frequencies (2.p.80). Such a comparison with mathematical expectation has the advantage of showing what proportion of the observations are unsatisfactory as well as giving an indication of the direction and magnitude of the excessive deviations.

Table 3 shows the observed distribution of χ^2 for the 91 families of plants from Smith's data and compares this distribution with expectation using the χ^2 values obtained from the 91 families individually for n = 1 (n = 1 in testing a 3 : 1 ratio). It will be observed that the expected class frequencies of less than 5 at one end of the table have been pooled, since the calculated distribution of χ^2 is not very closely realized for very small classes (2, p.83). This was necessary so as not to stress the importance of the two families with low χ^2. The same procedure, however, would not be justifiable at the other end of the distribution since the total number of families occurring in the four classes with highest χ^2 greatly exceeds the number expected. The 10 families in particular with χ^2 above 6.635 make a very striking contribution to the evidence of a poor fit. In this case n = 10, one less than the number of classes, because the value of n should be equal to the number of classes the frequencies in which may be filled up arbitrarily (2, p.78). The value of χ^2 is 105 and P is exceedingly small. The deviation from expectation is shown here again to be highly significant indicating that

TABLE 3.—*Test of agreement between observed and expected class frequencies applied to 91 F_2 families of sweet clover o nthe hypothesis of a 3:1 Mendelian segregation for annual and biennial growth habit respectively.*

		Expected*	Observed			
X^2	P	C	O	O-C	$(O-C)^2$	$\frac{(O-C)^2}{C}$
.0000	1.00					
		.91	2			
.0002	.99					
		.91				
.0006	.98			−7.10	50.41	5.5396
		2.73				
.0039	.95					
		4.55				
.0158	.90					
		9.10	5	−4.10	16.81	1.8473
.0642	.80					
		9.10	6	−3.10	9.61	1.0560
.148	.70					
		18.20	15	−3.20	10.24	.5626
.455	.50					
		18.20	20	+1.80	3.24	.1780
1.074	.30					
		9.10	12	+2.90	8.41	.9242
1.642	.20					
		9.10	8	−1.10	1.21	.1330
2.706	.10					
		4.55	8	+3.45	11.90	2.6154
3.841	.05					
		2.73	3	+ .27	.07	.0256
5.412	.02					
		.91	2	+1.09	1.19	1.3077
6.635	.01					
		.91	10	+9.09	82.63	90.8022
Total		91	91			
$X^2 = 104.9916$			$n = 10$		P = very small.	

*Found by multiplying the total number of families by the difference in the P values immediately above and below the particular value of C to be obtained.

the hypothesis of a single factor difference between annual and biennial sweet clover is entirely inadequate to account for the facts as revealed by the data.

While refined statistical analysis is an aid in determining the validity of a genetic hypothesis, it must be admitted that an adequate genetic proof of a hypothesis seldom can be made on the basis of F_2 data alone. The back cross method or the growing of the progeny of selected F_2 plants in F_3 is necessary in order to prove the number and nature of the genetic factors concerned.

SUMMARY

Conclusions based on the ratios obtained by summation of class frequencies in Mendelian studies may be widely misleading even though the sums of the frequencies approach very closely to the expected ratio. The χ^2 test of goodness of fit provides a useful means for comparing the observed results from Mendelian class frequencies with expectation both for single segregating progenies and also when large numbers of families are involved.

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ON THE EFFECT OF THE WHEAT-STEM SAWFLY, *Cephus cinctus* Nort.*, UPON THE SPRING WHEAT CROP IN WESTERN CANADA.

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Introduction

The wheat-stem sawfly, *Cephus cinctus* Nort. is one of the major insect pests regularly attacking the wheat crop in Western Canada. The annual loss to the farmers of Manitoba, Saskatchewan and Alberta varies from year to year but averages several millions of bushels annually. The area of farm lands in Canada infested by this insect includes parts of the provinces of Manitoba, Saskatchewan and Alberta. In the United States Ainslee *(1)* found it in a number of middle western states particularly in North Dakota. In Manitoba the area of economic infestation is south of the Riding Mountains and west of a line drawn north and south approximately through Portage la Prairie. Of the cereal crops, spring wheat, including both the *vulgare* and *durum* types, and spring rye alone are attacked to any important extent. Criddle (*4*) and Ainslee (*1*) mention certain grasses which are hosts to this insect. In the infested area the economic importance of this insect is due, however, almost entirely to its attack upon spring wheat and to a less important extent upon spring rye.

The insect is single brooded. The winter is passed in the larval stage enclosed in a protective membrane within the hollow base of the wheat or other stem below the surface of the ground. Pupation takes place in late May. Adults begin to appear before the middle of June and females, which lay about fifty eggs each, soon begin to oviposit within the hollow stems below the top joints of the host plants. It seems that in the field, when collecting adults under normal conditions by sweeping, the females greatly outnumber the males. In 1922, on June 20th, fourteen females and two males were taken. On June 22nd fifty-five females and no males were collected and on June 30th of the same year seventy-six females and no males were captured. In 1923 while sweeping in some six or eight fields near Souris, Manitoba, 144 females were caught during the time three males were captured. In the two years out of a total of 294 adults caught in the field only 5 of these were males. Under laboratory conditions in the spring of 1923, where adults were reared and both sexes were counted as they emerged, out of a total of 84 emerged adults 33 were males and 51 were females.

As soon as the young larva emerges from the egg it begins to feed upon the tissue on the inside of the stem. As the larva grows older it moves downward in the straw and makes a hole through each solid joint or node. The stem of the infested plant becomes a tube with a continuous hollow from top to bottom. Certain parts of the food of the larva are indigestible and these castings, which are left scattered along the inside of the stem or are packed solidly at times in places along the stem, are conspicuous when an infested

*Hymenoptera, Cephidae.

stem is split lengthwise with a knife. As the wheat plant approaches maturity the larva goes to the base of the hollow ripening straw and there cuts a ring around the inside of the stem about even with the surface of the ground. After this has been done the larva goes below this and prepares to spend the winter. This ring weakens the stem so much that it blows over readily. The result is that infested stems frequently are found lying flat on the ground out of the reach of harvesting machinery.

As soon as wheat comes in head and thereafter farmers can easily tell if a wheat field is infested with wheat-stem sawfly. This may be done by gathering stems from several places in the field and then splitting them open lengthwise with a knife. Uninfested stems are clean on the inside and the joints or nodes are solid. Infested stems show fine dust-like castings scattered along the hollow or packed solidly in certain portions of the stem. The hollow of the stem is continuous through the joints or nodes and sometimes the inside of the stem is slightly darkened. This is the only insect attacking cereals which causes injury of this type.

Investigation

This investigation was undertaken to determine the effect of the presence of the wheat-stem sawfly larvae upon the kernels forming in the heads of the infested stems. Tissue from the inside of the stem was consumed, the nodes were hollowed and frequently a great percentage of the infested stems was cut off almost completely at the surface of the ground before the crop became dead ripe. It seemed reasonable to suppose that not only was there an enormous loss due to fallen stems but also that the infested heads which stood up and were gathered by the harvesting machinery would contain inferior grain. The investigation to determine this damage was begun in 1921, continued in 1922 and 1925 and completed in 1927.

Samples of wheat from infested fields were obtained in two ways. The writer visited the infested areas and travelled from field to field and took representative samples. These were taken to the laboratory where the infested stems were separated from the uninfested ones and weighings made. Samples also were taken from fields by farmer owners themselves at the written suggestion of the writer and sent by mail to the Department of Entomology where they were examined. The weights shown in Tables 3 and 4 in 1921 are for shelled kernels. In 1922, 1925 and 1927 the weights are for whole heads of unthreshed grain. Care was taken to cut all heads from the straw at approximately the same place each time. In each year each sample taken was kept separate in the laboratory where it was spread out and allowed to dry thoroughly. The stems of each sample were split open and the heads from infested and uninfested stems were separated. These heads were counted and threshed by hand in 1921 and the grain weighed. In 1922, 1925 and 1927 the same method was followed except that the heads were not threshed and in consequence the weights are for whole unthreshed heads. In each year samples * of *vulgare* and *durum* wheats were collected. A large percentage of the samples was taken from the area covered by Carberry, Brandon, Virden, Melita, Deloraine, Hartney and Souris. Other samples were obtained from places outside of this area. Results of the compilation of the data are shown in Tables 1, 2, 3 and 4.

*The author wishes to thank those farmers who so willingly assisted in this investigation by sending samples of grain from their fields by mail.

TABLE 1.—*Wheat-stem sawfly infestation in Manitoba.*
Vulgare Wheats

Year	Total number of fields from which samples were taken	Total number of localities from which samples were taken	Total number of wheat stems examined	Total number of infested stems found	Total number of uninfested stems found	Greatest percentage of infested stems found in any field	Average percentage of infested stems found in all fields
1921	7	4	701	303	398		43.2%
1922	25	6	2456	1211	1245	97.7%	49.3%
1925	35	15	5533	1800	3733	93.0%	32.5%
1927	28	15	2405	431	1974	50.3%	17.9%
Sums and Average	95	40†	11095	3745	7350		33.7%*

† Some of these localities were visited in successive years.
* Average percentage of infestation for all fields studied for the four years.

TABLE 2.—*Wheat-stem sawfly infestation in Manitoba.*
Durum Wheats

Year	Total number of fields from which samples were taken	Total number of localities from which samples were taken	Total number of wheat stems examined	Total number of infested stems found	Total number of uninfested stems found	Greatest percentage of infested stems found in any field	Average percentage of infested stems found in all fields
1921	1	1	82	20	62		24.3%
1922	5	2	366	137	229	76.4%	37.4%
1925	5	3	545	143	402	50.0%	26.2%
1927	11	9	612	11	601	8.7%	1.7%
Sums and Average	22	15†	1605	311	1294		19.3%*

† Some of these localities were visited in sucessive years.
* Average percentage of infestation for all fields studied for the four years.

TABLE 3.—*Weight of wheat per head on uninfested vs. infested stems.*
Vulgare Wheats

Year	Total number of fields from which samples were taken	Total number of heads removed from uninfested stems and weighed	Total weight of heads in grams from these uninfested stems	Average weight in grams of each uninfested head	Total number of heads removed from infested stems and weighed	Total weight of heads in grams from these infested stems	Average weight in grams of each infested head
1921†	7	398	135.1	.33	303	107.3	.35
1922*	25	1245	927.9	.74	1211	1024.5	.84
1925*	35	3733	2746.4	.73	1800	1399.7	.77
1927*	28	1974	1413.2	.71	431	334.8	.77
Sums and Average	95	7350	5222.6	.71	3745	2866.3	.76

† The heads were shelled and the kernels only were weighed.
* The whole heads of unthreshed grain were weighed.

TABLE 4.—*Weight of wheat per head on uninfested vs. infested stems.*
Durum Wheats

Year	Total number of fields from which samples were taken	Total number of heads removed from uninfested stems and weighed	Total weight of heads in grams from these uninfested stems	Average weight in grams of each uninfested head	Total number of heads removed from infested stems and weighed	Total weight of heads in grams from these infested stems	Average weight in grams of each infested head
1921†	1	62	39.0	.62	20	17.3	.86
1922*	5	229	221.5	.96	137	146.0	1.06
1925*	5	402	488.6	1.21	143	137.8	.96
1927*	11	601	728.3	1.21	11	12.2	1.10
Sums and Average	22	1294	1477.4	1.14	311	313.3	1.00

† The heads were shelled and the kernels only were weighed.
* The whole heads of unthreshed grain were weighed.

Discussion

During the four years of the investigation 11,095 stems of *vulgare* wheats were split open and their heads separated into two classes, namely, heads from infested stems and heads from uninfested stems. Marquis was the dominant *vulgare* wheat examined although samples of Garnet, and other varieties were also included. Table 1 shows that the average infestation for the four years as obtained from an examination of samples from 95 fields was 33.7 per cent. It will be noted also that the yearly percentage of infestation has decreased in Manitoba very noticeably in recent years. In 1922 the average infestation was 49.3 per cent, while in 1927 it was 17.9 per cent. These figures are supported strongly by field observations taken in travelling through the infested area. Farmers are not depending upon wheat alone. The acreage of sweet clover is increasing rapidly and the crop rotations now in practice no doubt have made it much more difficult for wheat-stem sawfly to perpetuate itself where once it was so abundant. In 1922 the greatest percentage of infested stems found in any field was 97.7 while in 1927 it was only 50.3. Although these percentages are not so important as those already noted, they are significant.

In Table 2 data obtained from examinating samples from 22 fields show that the average infestation for that period in durum wheat was 19.3 per cent.. This compares very favorably with 33.7 per cent infestation for the *vulgare* wheats. Here also the percentage infestation has decreased in a marked manner in recent years. In 1922 the average percentage infestation was 37.4 and in 1927 in was 1.7. The greatest percentage of infested stems found in any field in 1922 was 76.4 while in 1927 it was only 8.7. A great change has taken place in the relative amount of *vulgare* and *durum* wheats grown by the farmers in the Manitoba area under consideration. Where in 1921 and 1922 fields of durum wheat were conspicuous because uncommon, in 1927 it was estimated that for every field of *vulgare* wheat there were from twelve to fifteen fields of *durum* wheat in certain areas. This no doubt also has had something to do with the decrease in the intensity of the wheat-stem sawfly outbreak in Manitoba.

The most important finding, however, of this study is shown in Tables 3 and 4. The average weight of each uninfested head from 6,952 stems of *vulgare* wheats for the years 1922, 1925 and 1927 is .73 grams while the average weight of each infested head for the same period from 3,442 stems is .80 grams. The figures for 1921 are here omitted as these weights are for shelled kernels. The average weight of each uninfested head is less than the average weight of each infested head it will be noted. For 1921 this is true for the weights of shelled kernels also. Similarly for the *durum* wheats the average weight of each uninfested head for 1922, 1925 and 1927 is 1.16 grams and for each infested head is 1.01 grams. For 1921 the kernels in each infested head weighed more than those in uninfested ones. A study of Table 4 will show that in 1921 and 1922 the average weights were greater for infested heads than for uninfested ones while in 1925 and 1927 the reverse was true. In the latter two years the *durum* samples were mixed with *vulgare* wheats which are lighter. Since they are more susceptible to infestation with wheat-stem sawfly the infested samples contained a greater percentage of *vulgare* heads. This accounts in part at least for the comparative weights shown.

Samples of both *vulgare* and *durum* wheats from uninfested and infested stems for the years 1922 and 1925 were submitted to the Field Husbandry Department, Manitoba Agricultural College* for their grades. These samples were graded as follows:—

Year	Class of wheat	Number of fields from which sample made	Samples from uninfested or infested stems	Grade
1922	Vulgare	8	Uninfested	No. 2 Manitoba Northern.
1922	Vulgare	8	Infested	No. 2 Manitoba Northern.
1922	Durum	4	Uninfested	No. 2 Canada Western Amber Durum.
1922	Durum	4	Infested	No. 2 Canada Western Amber Durum.
1925	Vulgare	11	Uninfested	No. 2 Manitoba Northern.
1925	Vulgare	11	Infested	No. 3 Manitoba Northern.
1925	Durum	5	Uninfested	No. 1 Canada Western Amber Durum.
1925	Durum	5	Infested	No. 3 Canada Western Amber Durum†.

†This sample contained *vulgare* wheat and in consequence was reduced at least one grade.

Conclusions

1. In recent years there has been a reduction in the severity of wheat-stem sawfly infestation in Manitoba in both *vulgare* and *durum* wheats.
2. *Durum* wheats are not so heavily infested as *vulgare* wheats.
3. The decrease in the percentage of wheat infested is at least partly due to the modifications which have taken place in the cropping practises of the area. A much greater percentage of *durum* wheats is now grown than formerly. Large acreages of sweet clover are now grown over much of the infested area in Manitoba.
4. The presence of the wheat-stem sawfly larvae in the *vulgare* wheat stems does not materially affect the weight of the wheat kernels. This was true for all years of the investigation. In the two years that samples were graded for 1922 there was no effect upon the grade while in 1925 the grade was reduced for the infested sample from No. 2 Northern to No. 3 Northern.
5. The evidence indicates that the effect upon *durum* wheats is similar to that upon *vulgare* wheats.

How to Avoid Loss

Since the presence of the wheat-stem sawfly larvae within the wheat stems does not interfere to any great extent with the normal development of the wheat kernels and reduction of the yield is due largely to fallen stems, it is important to see that wheat in infested fields is cut before it falls below the binder table level. It has been pointed out already that the larva cuts a ring around the stem of the infested plant before that plant becomes dead ripe. Bracken (*3*) found that the increase in the weight of 1000 kernels of Marquis wheat between the first cutting (August 18th) and the last cutting (August 26th) was 1.54 per cent. He says, "It is apparent in both of these tests (1915 and 1916) that the later the cutting was done up to the 'hard glazed' condition, the larger the yield and the better the quality secured. No attempt has been made to determine the losses from shattering. The prac-

*Thanks are expressed to T. J. Harrison, Professor of Field Husbandry, Manitoba Agricultural College for grading these samples.

tical man realizes, however, that the loss from this cause is greatest in the most mature grain and less in the earlier cuttings." Harrington *(6)* investigating the optimum time to cut rusted wheat says, "The results obtained at Saskatoon in 1927 show conclusively that rusted wheat should be harvested like unrusted wheat at the normal time, two or three days before it is fully ripe." He found that the "average kernel weight considering all of the varieties together showed significant increase from Aug. 24 until two days before maturity." Arny and Sun (*2*) found, "Lower weight per bushel resulted from premature cutting. There was not enough reduction in weight per bushel for wheat cut when the terminal spikelets were turning color and the kernels in them were in the hard dough stage (seven days early) and for oats cut when the kernels in the terminal spikelets were in the thick milk stage (seven days early) to make any change in the market grade as compared with the same grains cut at maturity." Stoa *(7)* says "Wheat maturing normally is ready for harvesting when in the semi-hard condition. Too early harvest lessens the yield and quality of the wheat produced." He says further, "Over-ripeness reduces the yields through shattering, excessive drying and needlessly exposes the crop to insect pests, hail and other crop destroying agencies." Ellis (*5*) found that cutting when the grain was firm resulted in the greatest weight per bushel and the greatest yields.

The concensus of opinion of investigators seems to be that the greatest yields and the finest sample of wheat are obtained when the crop is cut two or three days before it is dead ripe. This applies to both rusted and unrusted wheat. Other local factors, however, may have a bearing upon the length of time before maturity that it is advisable to cut wheat in order to harvest the greatest weight per acre.

As has been pointed out already a heavy infestation of wheat-stem sawfly, especially in a dry year, results in a great percentage of the infested straws falling by the time the crop is ripe. Where such infestation exists it is suggested that the cutting of the crop be completed before it becomes dead ripe. Each field should be examined by splitting stems and the percentage of infestation determined. Fields showing the highest percentage of infestation should be cut first and those showing little or no infestation left until last, providing the fields show approximately equal maturity.

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EASTERN CANADA SOCIETY OF ANIMAL PRODUCTION

Reports presented at First Annual General Meeting, Quebec, P.Q., June 14, 1928

REPORT OF DAIRY CATTLE PRODUCTION COMMITTEE

E. S. Archibald, Chairman

The Eastern Canada Society of Animal Production, formed in the latter part of 1926, and which as yet has scarcely started to function, would be fully justified if it functioned for dairy cattle production alone. The honour given me of being the first Chairman of the Dairy Cattle Production Committee was much appreciated, hence it is doubly with regret that I must report that it has been possible to do relatively little in this work. Nevertheless, a little has been done which I beg to report on herewith.

The logical object of this Committee, as of the Society, is to bring together all investigators, teachers, and others interested in this subject, for full and complete discussion of the many problems with which the industry is faced. This Committee collectively should consider present and future problems, methods of investigation, apportionment of investigations to the different institutions having the facilities, and continuously function in a thorough and proper interpretation and distribution of the results and information.

A Review of Past and Present Experimental Work in Dairy Cattle Production

The different Provincial and Federal institutions existing in the five Eastern provinces of Canada have unfortunately had no organization which would continuously draw together men interested in dairy cattle production, and in consequence have a very meagre conception as to the past experimental work which has been accomplished. It is true that some individual workers in many of these institutions have made careful review of literature, but many lines of investigation, past and present, have not been published. Again, a number of these men have through personal contact gained a fair working knowledge of the more important lines of experimental work which have been conducted elsewhere in Eastern Canada, but all lack a complete file, thoroughly indexed, of all the experimental work which has been conducted in the five Eastern provinces.

When it is considered that Eastern Canada during the past fifty years has had the ablest men in animal husbandry and dairying to be found in Canada, that these men had vision, had some facilities for some investigational work and have conducted a limited amount thereof, it is most regrettable that succeeding generations have not available a complete file of the work and findings of these men in the various institutions. No doubt a careful review of past experiments would show completed work which, properly interpreted in the light of present problems, might be considered more valuable than expected. Many other experiments might require doing

over in whole or part, because of errors in outline or lack of applicability to present conditions. Whether or not the complete review of all past work should be the basis of the work of this Dairy Cattle Committee may be debatable, but eventually any committee attempting to do most thorough work should have such a review available.

The only way such a collection and review of data would be possible is through the whole-hearted contribution of all the various institutions. Such was asked for in a letter dated December 1, 1926, and addressed to those responsible for the dairy cattle work at all the Provincial and Federal institutions throughout Eastern Canada. It was hoped that this would be immediately forthcoming and that early in 1927, a meeting of the Committee as a whole might be called for consideration of these data.

It was then hoped that various sub-committees would take over the data on those subjects on which they were given authority and that they would prepare the following:

(1) A complete thorough analysis of their subject material.

(2) Recommendations as to the present experimental work being conducted.

(3) A list of problems for future work.

(4) Recommendations as to experimental methods.

(5) A suggested apportionment of such work amongst the different institutions.

(6) Suggestions as to an annual review of work where two or more institutions are conducting the same work requiring the frequent comparison of results.

Suggested Sub-Committees

Thinking that the work could be best apportioned and organized amongst the various members of this Committee by appointing sub-committees, the following were suggested by the Chairman and were accepted by the other members of the Committee:

(1) Committee on Dairy Cattle Diseases and Parasites—R. L. Conklin.

(2) Committee on Dairy Cattle Nutrition—W. J. Bell.

(3) Committee on Dairy Cattle Genetics—J. C. Steckley.

(4) Committee on Dairy Cattle Economics—G. Toupin.

(5) Committee on Dairy Cattle Extension—J. M. Trueman.

(6) Committee on Dairy Bacteriology—E. S. Archibald with the assistance of A. G. Lochhead as Vice Chairman.

It is unfortunate that the material for complete review of past and present work was never made available so that this might be turned over as a basis of work in order to start the activities of these sub-committees.

Accomplishments to Date

As above mentioned all the various institutions were solicited for a complete file, or at least a comprehensive summary of work which had been done to date.

Of all the Dominion Experimental Farms, a complete file has been presented, the same prefaced with a complete index of the work at each institution.

I regret to state that of the ten Provincial institutions which have existed, or do exist, in the Eastern Provinces, which might have at least some data relative to past experimental work in connection with dairy cattle and dairying, only one has contributed any data, although most of these promised immediate consideration and the compilation and forwarding of same. It is really because of this that the Committee has not gone farther ahead in its work.

Review of Data from Dominion Experimental Stations

I beg to present to this Society the analysis of a complete review of all the information, the results of experimental work to date. At the front will be found an index of these data, which shows the general classification of this summary under the following heads:

(1) Breeding.
(2) Cost Studies.
(3) Feeds—roughages.
(4) Feeds—grains and mineral supplements.
(5) Health Studies.
(6) Housing Studies.
(7) Management and Feeding Methods.

At the back of this is the detailed index of each of the various Stations, which shows the source of material summarized.

Since, however, this summary deals only with the work of Dominion Experimental Farms, and since other information has not yet been made available, I recently solicited from all the members of the Committee their suggestions and recommendations on the four following topics.

I regret to say that even in this I have managed to inspire very few replies and relatively few suggestions other than those which I had already classified after a review of past and present experimental work. However, I beg on behalf of the Committee, and I trust with their full sanction, to offer the following suggestions:

(a) *Present Experimental Work being Conducted by Federal and Provincial Institutions:* This Dairy Cattle Committee should meet in order to agree on a complete review of all dairy cattle experimental work being conducted at the present time. The Dominion Experimental Farms have published recently a "Guide to Experimental Projects" in which experimental projects under way are classified. Provincial institutions have not as yet published such a complete index of experiments under way, and such should be made available to this committee if a thorough review of present experiments is to be undertaken.

(b) *Suggestions as to Future Lines of Investigation:*

(1) Dairy Cattle Diseases and Parasites:
  (a) Cooperation of dairy husbandmen, and all available pathologists in the study of contagious abortion.
  (b) Cooperation of dairy husbandmen and available pathologists in the study of sterility.
  (c) Spermatazoa Morphology.
  (d) Factors influencing udder disturbances.

(e) Environmental factors affecting disease susceptibility and reduced vigour.

(2) Dairy Cattle Nutrition:

(a) Mineral deficiencies in the rations and pastures in different parts of Eastern Canada studied under the headings of calcium, iodine and phosphates, and the relative functions of each.
(b) Relationship of feeding meagrely or intensively on the development of future milk production in dairy cattle.
(c) Sources and relative values of proteins.
(d) Protein requirements.
(e) Moulds in silage and their relative toxicity.

(3) Dairy Cattle Breeding:

(a) How may Canada breed more high class dairy bulls?
(b) Study of inbreeding in grade herds.
(c) Study of inbreeding in pure bred herds.
(d) Fundamental breeding studies as equipment and men become available.

(4) Dairy Cattle Economics:

(a) Greater total production per farm as influencing gross revenue and more permanent place on world's markets.
(b) Superior quality of cattle and of dairy products, namely, cheese, butter, cream, etc., for export.
(c) Relationship of greater production to lower costs.
(d) Cheaper feeds. Farm-grown feeds with mill feeds to supplement. Co-operative buying.
(e) Reducing costs by herd culling.
(f) Study of pastures available, and methods and importance of improving pastures.
(g) Study of silo capacities and standardized ratings.
(h) Study of better disposal of dairy by-products.
(i) Study of cheaper buildings and equipment with greater durability to reduce overhead.
(j) Study of and recommendations re cooperative manufacture and selling.

(5) Dairy Cattle Extension Work:

Recommendations as to how both Federal and Provincial institutions in Eastern Canada doing extension work can unite their efforts more than at present toward inducing farmers to use better sires, better feeding, better manufacturing and selling methods, according to present day knowledge.

(6) Dairy Bacteriology:

Since the quality of Canada's dairy products is of supreme importance, and since dairy bacteriology is the science largely surrounding this important factor, still more work by the scientists is necessary. The quality of dairy products starts at the farm. Some qualities are inherited, hence cooperation between the bacteriologist and the animal breeder is necessary. Those qualities

of milk which are not inherited may or may not be determined by the milk as drawn from the cow.

Udder contamination is one source of low quality. Contamination of milk through utensils, atmosphere, etc., is another.

Later on after the milk leaves the farm, factory contamination or ill practices may largely induce low quality.

Canada's dairy products are improving rapidly with the demand from other countries, but there is still a vast field for practical improvement and much of this must be based on sound research.

(c) *Suggestions re Standardizing Experimental Methods:*

Agronomists, chemists, plant pathologists, and others in recent years have made tremendous strides toward making investigational work reliable through the standardizing of methods. Animal husbandmen have much to do in this regard, if work conducted by different investigators in different institutions under different control and in different parts of Eastern Canada is to be equally reliable and susceptible to the same mathematical calculations and deductions.

(d) *Suggestions as to Apportioning Lines of Investigational Work Amongst the Different Institutions:*

I claim that there has been practically no undue duplication of any experimental work which has ever been conducted in Eastern Canada. The great lack has been that of thorough and systematic coordination of results. Moreover, replication of work is always essential if major problems are to be solved thoroughly and proven satisfactorily under different soil and climatic conditions. Nevertheless with the various institutions now available in Eastern Canada, workers should harmoniously agree upon the lines of replication, and where such is not necessary, either major or minor problems should be harmoniously apportioned to different institutions having equipment and men available therefor, so that the field of necessary research may be covered as quickly as possible. At that, many years will lapse before dairy production problems are solved so that the producer may function with the least number of handicaps and retarding factors.

CENTRAL EXPERIMENTAL FARM,
OTTAWA, ONT.

REPORT OF SHEEP PRODUCTION COMMITTEE.

A. A. MACMILLAN, Chairman

In analyzing the industry it was found that problems of a varied character presented themselves. These were, first, varying degrees of breed improvement in provinces and districts as affecting market lambs and commercial wool grades; second, feeding problems arising from varying pasturage and crop limitations, the result of varying climatic conditions affecting seasons; third, markets; fourth, parasites.

Canadian lamb is now marketed through three channels: local, central and export. Canadian wool is also marketed to Canadian mills, to the United States and to Great Britain and Continental Europe. These mar-

kets and market outlets are recognized as factors having an economic bearing on the marketing of both wool and lambs.

While Canada may be considered as one of the younger Dominions, it so happens that as a result of ardent zeal in the improvement of our sheep flocks we have been heavy importers of sheep both from Great Britain and the United States. Furthermore, in our sheep practices, we have adopted to a considerable degree at least some of the easy methods of management practised in the Old Country, but have neglected some of the more exacting details found necessary under more intensive farming practice. The result is that from imported breeding stock and the general belief that our flocks are free from parasitic infestation, together with the following of methods which have not been conducive to the eradication of parasitic infestation, we have now a problem of parasitic control which appears to be much more general than is at present recognized.

In assuming its duties this Committee decided that for the first year at least the scope of activities would be confined almost entirely to an analysis of the sheep industry as it exists in Eastern Canada at the present time. In order to cover the various phases of the industry the Committee was sub-divided as follows:

Sheep Nutrition—Geo. W. Muir.
Genetics and Cross Breeding—L. H. Hamilton.
Promotion and Extension Work—X. N. Rodrigue.
Wool Improvement and Marketing—L. E. O'Neill.
Sheep Economics and Lamb Marketing—J. K. King.
Sheep Parasites—Lionel Stevenson.

The Chairmen of the various sub-committees in assuming their duties have given very careful and individual study and investigation to the phases of the industry allotted for their consideration. Members of the Committee have lost no opportunity to discuss in detail the many and varied problems confronting the sheep industry. The first meeting of the Committee, as such, was held at Macdonald College on Tuesday, April 19th, 1928, when reports were presented by the various Chairmen. Time and space do not permit giving these reports in detail; however, an effort will be made to summarize the most important suggestions.

The sub-committee on sheep extension work reports that 33% of the farms in Eastern Canada are engaged in sheep production. Exports of meats (mutton and lamb) from all the Eastern Provinces with the exception of Ontario exceed imports. This is due largely to the export of Canadian mutton and lamb to the New England States. Consumption figures indicate that during the last two years consumption has increased considerably in the Eastern Provinces due in part to the expansion of tourist trade. A very profitable trade in wool and homespuns is also being built up with tourists who are ready to pay high prices for this class of products.

Quite recently a new industry has developed in the Province of Quebec, this being the manufacture of sheep pelts into fur which is used for fur coats (ladies' and gents'), coat trimmings, lap robes and various kinds of dusters. In 1927 over 10,000 sheep pelts were utilized in this industry. The popularity and expansion of the industry indicate a rapidly increasing con-

sumption of sheep and lamb pelts by this industry with the probable result that certain pelts with the desirable characters and quality may advance materially in price.

Sheep raising has continued to be a profitable phase of agriculture in the Eastern Provinces since the introduction of sheep by the early settlers and with greater consumptive demand for both wool and lamb due to increased industrial expansion and the steady development of export markets for both wool and lamb, the Departments of Agriculture, both Federal and Provincial, have recognized the opportunity which sheep raising offers to the rank and file of farmers in the Eastern Provinces. The Departments of Agriculture, therefore, have evolved policies whose primary object has been to improve the quality of commercial lambs and commercial wool grades. These policies have included the introduction of good quality purebred rams; the grading of ram lambs for purebred breeders; the establishment of sheep breeding centres where a breed most suitable for the district is kept; the marketing of lambs co-operatively and the encouragement of all practices in sheep husbandry which go with good flock management.

Mr. X. N. Rodrigue, in tendering his report, stated that while it was not possible to review in detail these policies, he would like to submit the following facts regarding their operation in the Province of Quebec which he felt would involve principles applying to other Eastern Provinces:

In 1919, twenty-five purebred rams were placed under the Ram Premium Policy with farmers who had never previously used a purebred sire and since that time over nine thousand have been introduced under the policy. This policy necessitated an improved method of marketing the better quality lambs thus produced. Consequently, the Lamb Show Policy was formulated and from a beginning in 1922 of one lamb show of some 600 lambs, the policy has extended to the point where over 35,000 lambs of good quality were marketed in 1927, which represents over 36% of the Quebec lambs marketed at Montreal.

According to a statement issued by the Live Stock Exchange at Montreal, the net result of the various policies inaugurated by the Provincial and Federal Departments of Agriculture in Quebec have benefited the farmers to the extent of three quarters of a million dollars in increased revenue from their flocks during the past five years.

Suggested Methods of Extension

After having studied the various phases of sheep extension with officials who are chiefly responsible for the direction of this work, may I present the following suggestions for your consideration:

1. The highly satisfactory results obtained from existing organizations justify their further extension.

2. The average farmer today is almost entirely dependent upon the assistance of the extension man for the improvement of the quality of his flock and the sale of his purebred lambs and it is obvious that as improvement work expands an increasing number of promoters and more financial assistance will be required to continue the work.

3. The importation of rams from the British Isles was responsible for a material improvement in many of our purebred flocks and while I am of

the opinion that any further importation would receive favourable consideration, I would suggest that it is important that every precaution be taken to avoid dark wool which greatly depreciates the value of the sheep for breeding purposes.

4. In view of the fact that the production of high quality commercial lambs depends to a great extent upon the use of a good sire, it is urgent that means be taken to ensure the production of rams of the desired quality. The purebred breeders recognize this fact but do not always adhere to it in practice.

5. The policy of ram grading has become general throughout Eastern Canada and after several years of experience it appears necessary to establish even higher grade standards in order to protect the purebred industry and the trade.

6. The Sheep Club Policy which has recently been inaugurated by the Dominion Live Stock Branch in co-operation with the Provincial Departments of Agriculture, is applicable to practically every district in Eastern Canada, and will do much towards the development of the industry and I would recommend that it be applied particularly to sections where either only very few or no sheep are being kept.

7. The Dominion Government could render an important service to the sheep industry of Eastern Canada by financial assistance in the advertising of its improved commercial lambs. This would tend to increase consumption which at the present time is estimated at less than 9 lbs. per capita in Canada as compared with 22 lbs. in Great Britain and 72 lbs. in Australia.

8. The last suggestion I have to offer, and which to my mind is extremely important, is that 100% co-operation must exist between the Provincial and Dominion Departments of Agriculture and their officials in order to obtain maximum results.

The sub-committee on wool improvement and marketing in reviewing the developments to date point to the wool grading policy of the Dominion Live Stock Branch which has been in operation since 1913 and which applies to all co-operative consignments of wool handled by the Canadian Co-operative Wool Growers' Ltd., a producers' organization organized in 1918. As a result of commercial wool grading and the contingent field work carried on in conjunction therewith, consisting of sheep shearing demonstrations, the giving of instruction in the proper methods of caring for wool both before and at the time of shearing, rolling the fleece and packing for shipment, great progress has been made in the quality of Canadian wools. Canadian wool grades now enjoy market recognition not only by Canadian mills, but also in the United States, Great Britain and Continental Europe.

The improvement of Canadian flocks from the standpoint of the production of market lambs has resulted in considerable general improvement towards the production of more of the finer and higher priced grades of wool. It is recognized, however, that hand in hand with market lamb production looking to the attainment of a higher degree of perfection in mutton conformation, should be associated an investigation and research policy so

that our wools will at the same time be improved to the highest degree possible as mutton type is perfected in our flocks.

We are pleased, therefore, to report at this time the activities of the National Research Council which, in co-operation with the Department of Agriculture, has appointed a special wool committee of which the Chairman of this Committee is a member. This committee has already held several meetings. Statistics have been obtained from the manufacturers indicating the Canadian mill requirements of the various grades. This information permits of analyzing our wool production according to grades in relation to mill requirements and will give the producer some light for the first time on the wool grades for which there is a larger market outlet in the Dominion.

During the summer a survey of the range flocks will be made to ascertain what practices are being followed by the ranchers and it is hoped that definite recommendations can be made leading to the adoption of a definite policy for range flock improvement. In Eastern Canada it was proposed to initiate a purebred flock wool survey relating to commercial wool grades to individual ewes and rams of the popular breeds now being bred and from which rams are distributed to the grade flocks of the Eastern Provinces. It was anticipated that this information when compiled would suggest further studies leading to the elimination of undesirable characters in our domestic flocks, such as black fibres, the appearance of kemp, modulated fibres, lack of uniformity in the fleece and a number of other qualities essential to the best milling results. Professors Sackville and Shaw were delegated to compile information covering investigational work already undertaken in other countries and Dominions including Great Britain, South Africa, New Zealand, Australia, the United States and South America. Their report submitted at the last meeting covered also details of laboratory equipment necessary for the carrying on of wool investigational work. The review of work undertaken and under way to date in other countries indicates that although laboratory studies in wool have been in progress for some time, it is only within the last few years that a definite improvement in technique and standardization of method has taken place.

It may be said in conclusion that Canada is in the foreground so far as the commercial grading of wool is concerned. Her wools are gaining steadily in favour for milling purposes both at home and abroad. Her real problem lies in correcting common wool defects which manifest themselves in all countries where sheep are kept. The possibility for betterment of grades lies in a closer study of wool qualities within breeds and a better knowledge of the factors affecting wool qualities under the conditions of management which must of necessity be followed in Canada.

The sub-committee on Sheep Genetics and Cross-breeding reports that from a survey of this field it is felt that very little work is being done of a scientific nature and that the importance of this phase of the industry warrants more consideration.

Throughout Eastern Canada a great deal of flock improvement work has been accomplished through the general distribution and sale to farmers of purebred sires. The result of improvement is to some extent being measured

through the medium of sheep fairs and the marketing of carloads of market lambs.

One of the major problems presenting itself today to the district agriculturist or promoter is the best means of developing a farm flock. Regarding the sheep flock at Macdonald College, Mr. L. H. Hamilton has the following to say:

"The measuring stick of progress in any field and particularly at many of our Colleges is—what have you to show? Or what results have been obtained? Due to finances our policy has been one of studying breeding and selection and by this developing a flock of superior excellence. So far as this phase is concerned we have had very gratifying results with two breeds, viz, Cheviots and Southdowns. Our original numbers were small and the individuals were of many types. During the last five years we have been successful in fixing a uniform breed type, increasing the weight of our sheep ten per cent on the average and improving the quality and uniformity of the fleece very markedly.

"The results of improvement in conformation and weight are seen in the results of the shows. Our stock, though not exhibited by ourselves, has been shown at a number of the largest shows and has always stood top or near the top with the result that our breeding has been sought after more and more every year. In wool, the percentage of wool grading medium has been increased ten per cent and all the wool falls into practically two grades which indicates the uniformity which has been obtained. This is true of the Cheviots. The wool so far as Southdowns have been concerned is specially classified as Southdown clothing wool, so that we are not able to show improvement in such a definite way.

"Careful individual selection of the females to be left in the flock, the use of the right kind of sire and good management are the three keystone pegs around which to work. All are important, each depending upon the other to a great extent. The individual study of each member of the flock reduces the number of poor breeders, increases the uniformity and size and generally raises the standard of the flock as a whole.

"The selection of the right sire is probably the most difficult point because the individuality of an animal is only a partial indication of what may be expected in the offspring. As an example, we have all seen rams particularly free from dark fibres bred to ewes free from dark fibres leave offspring with a considerable amount of dark wool. The breeding record of rams is, therefore, important."

Other matters suggested as requiring further study are pedigree studies of rams and fertility in breeding ewes.

Cross-Breeding

Sheep improvement policy to date has been confined almost entirely to grading up of farm flocks. Cross-breeding in any country is contingent on the use of purebred sires and the maintenance of pure blood lines in the breeding ewe. Colleges and Governments have hesitated to recommend cross-breeding to the individual farmer; however, with community enterprise and district supervision by promoters it now appears feasible to consider the initiation of such practice particularly if the Canadian sheep industry

expands to the point where production exceeds our consumptive demand. Mr. Geo. Rothwell, Dominion Animal Husbandman, reports several years of cross-breeding work with Leicesters and Shropshires at the Central Experimental Farm, Ottawa, and with the use of Cheviot and Shropshire rams on grade Oxford ewes at the Lennoxville Experimental Station. Cross-bred commercial lambs from matings of these breeds have shown remarkable thrift and vigour. They have attained market weights and finish at an early age and the carcasses when graded on the rail were pronounced as an exceptional lot by the packing company.

Dominion Live Stock Branch Promoters have also been instrumental in introducing limited numbers of rams of the smaller breeds for the breeding of grade ewes graded up from rams of the larger breeds. Progeny of this mating have come to the front prominently at inter-County competitions held at some of the largest exhibitions.

In this connection your Committee would suggest as points for further experimentation:—

1. Experiments with rams of small breeds on ewes of the larger breeds to ascertain comparison of market qualities in progeny.

2. Experiments with lambs of different breeds to ascertain relative value of breeds in production of commercial lambs, also the age and weight at which lambs of the various breeds finish to best advantage for the flock.

Report on Nutritional Studies with Sheep

A brief survey of the experimental work in sheep feeding, without making a definite compilation of same has shown that nutritional studies with sheep have not in the past been made prominent features of the experimental work with live stock in Eastern Canada, more attention having been given apparently to other classes of stock, particularly dairy cattle and swine. Such work as has been carried on and reported has been largely along the line of the winter finishing of lambs. In the past, this was undoubtedly one of the main problems in sheep feeding, for each fall there was a large percentage of unfinished lambs on the market. These lambs, when carried over and fattened, were in most cases able to show a profit. They were, however, usually quite heavy when finished, and as the general trend of market demands has been for a much lighter but well-finished lamb, the practice of late winter feeding of lambs is not now so profitable, as the finished product if too heavy does not meet the market requirements. Furthermore, it would seem more economical to endeavour to have all lambs brought along in such condition that they could be finished and marketed before the end of the grass season rather than allowed to reach this period in thin condition, necessitating much expensive winter grain feeding if the desired finish is to be obtained.

The bringing of the lambs along in such shape that they can be marketed off the grass is a problem in management and feeding that begins with the feeding of the ewe at weaning and breeding time the previous year, but probably the greatest problem in so far as lamb production is concerned is one of the *winter feeding of the ewes both before and after lambing,*

with the object of securing a strong, healthy lamb crop and keeping these lambs thriving until such time as they are turned to pasture. Work along this line would seem very timely in view of the many enquiries regarding lack of milk on the part of early lambing ewes. The problem may even involve selection of ewes on their milking qualities.

Secondary to this major problem in lamb production there would appear to be the one of the early fall finishing of lambs, while in some cases there may be a minor problem of the early winter finishing of lambs not fit for marketing by the end of October.

Recommendations re Feeding Projects in Lamb Production

Your Committee, therefore, strongly recommends that the consideration of the Animal Husbandry Divisions of the Experimental Farms and Agricultural Colleges of Eastern Canada be given to the following problems in sheep nutrition:

A—Most Suitable Rations for Breeding Ewes.

1.—Previous to breeding.

2.—During pregnancy.

3.—After lambing.

The measure of efficiency in any trials conducted to be determined on the following points:

1. The weight and condition of the lambs at birth.
2. The ability of the ewe to suckle her lambs, measured by the gain and general thrift of the lambs while suckling the ewes.
3. The general thrift and condition of the ewes throughout the trial.
4. The cost of the rations used.

Poorly fed lots and well fed lots could be carried and the lambs in both lots might very well be followed through to marketing age, and if material were found available further experiments could be conducted as follows:

B. Most Suitable Supplementary Rations for Finishing Lambs on Grass

1. Forage crops.
2. Concentrates.

The foregoing might possibly leave material suitable for experiments on:

C. Most Suitable Rations for Early Winter Finishing Lambs.

The results of such a series of experiments should throw considerable light on many of the present day sheep feeding problems.

Other problems not necessarily entirely nutritional, but in which nutrition plays a part might be enumerated as follows:

A. Effect of parasitic infestation on nutrition.

B. Effect of various planes of nutrition on growth and quality of wool carried on in correlation with the studies in feeding of ewes for efficient lamb production.

Aside from the reports submitted by the Chairmen of the various sub-committees there were several matters to which the Committee as a whole gave special consideration, and on which resolutions were passed, as follows:

1. *Extension of the Sheep Industry.*

"That this Committee considers that more concentrated effort should be undertaken by the promotion staff of the Provincial and Federal Depart-

ments of Agriculture with a view to increasing the productive capacity of existing flocks and that new flocks, when established, should be centralized in districts where careful supervision can be provided for the first year."

2. *The popularization of lamb as a meat and the establishment of official grades for lambs and lamb carcasses.*

"That this Committee recommends that the Dominion Live Stock Branch appoint a lamb grading supervisor to study the problems relating to lamb marketing including the possibility of establishing official lamb grades and lamb carcass grades and that this man pay special attention to evolving a policy for the popularization of lamb as a meat."

3. *Promotion projects.*

"That this Committee is in favour of the extending of the ram grading and wool grading policies so that an approved flock policy may be established."

Dominion Live Stock Branch,
Ottawa, Ont.

REPORT OF SWINE PRODUCTION COMMITTEE

G. B. Rothwell, Chairman

In presenting this report, it is desired to express sincere regret and apology for the comparatively small amount of work that has been done by the Committee on Swine. The blame for this situation must be laid at the door of the Chairman, and in this connection, possibly little excuse exists, other than the fact that the Chairman has found great difficulty in getting his Committee called together. The Chairman is called upon to spend considerable time in travelling, and his time is well filled while at home. As already stated, the great difficulty has seemed to be found in choosing a suitable time when all members might be brought together without undue inconvenience.

Nevertheless, while no meetings have been held of the full Committee, various discussions have taken place with individual members or groups thereof. Further, in the fall of 1927, several of the members of the Swine Committee were able to meet with members of the Sheep Committee in a consideration of one of the vital problems as affecting swine, namely, parasitism.

The function of the Committee has been kept continually in mind by the Chairman, and it is possible, notwithstanding the fact that no formal meetings have been held, that certain ideas have been formulated that may bear fruit in the future.

Review of Experimental Work with Swine in Eastern Canada

In consideration of necessary work in the breeding, feeding and management of swine, it is desirable and at least logical, that those considering such work should have for reference full knowledge of work that has been conducted in the past. With this idea in view, the Chairman has drawn together reports of work conducted on the Dominion Experimental Farms System and as concerning swine breeding, these covering the period from the start of experimental work in this connection, up until the present time.

The result has been a mass of experimental data, and whether this work may prove of any value to the Eastern Canada Society of Animal Production or not, it may be safely stated that it has proven of considerable value to the Chairman and those connected with swine breeding and feeding work on the Experimental Farms. It had been the hope of the Chairman that similar collections of data might have been secured from other Institutional Farms and Colleges in Eastern Canada. To date, little of this information has come to hand, and the brief conclusions herewith drawn, as concerning work conducted in Eastern Canada, are, of necessity, taken from the reports of the Dominion Experimental Farms.

Any detailed report, summary or synopsis of the work referred to would be impossible at this juncture. This much may be said, that a vast amount of work has been done in connection with the housing of swine of all ages and under different seasonal conditions; of the feeding and rearing, either of market or breeding stock; and of costs of production as referring to market and breeding stock. Special attention has been given to such specific problems, for example, as comparisons of sources of protein for growing pigs; the causes of soft pork; milk substitutes, as, for example, tankage, fish meal, commercial substitutes, etc.; tests of commercial hog feeds, supplementary feeds, etc.; studies of the effect of potassium iodide in the feeding of swine; the mineral requirements of swine, etc. These may be regarded as simply some of the high lights of the volume of work carried on in the past. In all, there have been some 640 projects.

Your Chairman has been of the opinion that considerable good has resulted from this work. Nevertheless, a critical review, under our present light of knowledge, will reveal certain general defects as applying to at least parts of this work, and these may be listed as follows:

1. Numbers in experiments have been necessarily limited, and in some cases it has been difficult to draw conclusions, largely due to the fact that lots were represented by too few individuals.

2. The fact that the application of proper experimental methods has not been fully appreciated or understood in the past, has had its effect.

3. What constitutes in your Chairman's mind possibly the most serious defect in the past, as relating to present conditions, is that, for many years, experiments were based largely on comparative costs of production, irrespective of the type or quality of the product. When a change in marketing regulations was brought about, and when the discriminating factor of quality or type of market product was given its proper appreciation, it was found that much of this work had to be duplicated. In other words, at the present time, it is necessary to carry the observations in connection with feeding tests not only to the time where the market hog, for example, is at market weight, but on through slaughter to the Wiltshire side. Practically all experimental work with swine at the present time must have its bearing on this final objective.

As a subject for experimentation, the pig has many desirable qualifications. They may be dealt with in numbers. They are prolific. The life history of the market hog is short. Much data may be secured in a short

time. Realizing, then, that much work has been done in the past and admitting that to a part of this work, certain logical criticism may be directed, a review has proven of very great interest, in that it has helped your Chairman in making a few suggestions as to what would appear to be the most necessary fields for investigation at the present time, as revealed by work done in the past and as indicated by present conditions. Before touching on these points, it may be stated that this review has been prepared and that it may be turned over to this Society at any time should it be needed.

Suggested Lines for Study and Experimentation

It would be possible, undoubtedly, to set forth an extended list of present problems as affecting the rearing and feeding of swine. It is the intention to suggest and briefly discuss only a very few, these as representing, in the Chairman's opinion, certain lines of work where further study and information would seem highly desirable.

1. More definite knowledge concerning the breeds and strains thereof that we now have, these in relation to market type. This formed a subject of discussion for members of the Swine Committee and has been given some consideration during the past six or seven years. Frequent discussions which took place between your Secretary and the Chairman of the Swine Committee resulted some time ago in a decision to bring this point up for discussion, and, in fact, to make it the major point of discussion at this session. Fortunately, very shortly afterward, it was found possible to take up the consideration of this problem in a more active way. Within the present year the Deputy Minister of Agriculture of the Federal Department called together a number of men interested in swine-breeding, either from the practical or experimental standpoint, and as a result, a body was formed, known as the "Board for the Advanced Registry of Swine". Since a number of the members of this Society may not be familiar with this considered project, or with the meaning of the term "Advanced Registry of Swine", your Secretary and Chairman decided that it might be to your interest to have the matter briefly and comprehensively reviewed at this meeting. As a result, the paper which follows this report and as given by your Secretary, should supply authentic information concerning one of the most vitally necessary steps which can be taken in connection with the improvement of Canadian swine at the present time, in your Chairman's opinion. We have too few constructive swine breeders in the Dominion of Canada. It has been stated that we have too many breeds in the Dominion of Canada, particularly when our work is compared with that of other countries. We have too little knowledge of the desirable strains, families or types within breeds that exist. There is in evidence a very considerable lack of uniformity which results largely from lack of uniformity in breeding and in type, and which is affected to a certain extent by methods of feeding. Briefly, it has been considered that some method of recording the type, quality, and breeding propensities of the swine owned by our pure bred breeders might be of immense value, in that the breeder of pure bred stock is really the fountain head of the industry and that

uniform production of the right type of breeding stock will ultimately and quickly reflect itself on similar conditions in the hands of the farmer who produces our market hogs. In that this question will be taken up fully, your Chairman desires only to introduce the subject in this way.

2. A further study of swine parasitism. To this matter much consideration has already been given, particularly during the past two or three years. It is fairly well admitted at the present time that many of the difficulties that have been met with in swine rearing and that have been attributed to other causes, have, in reality, been the result of parasitism. The control of parasitism in swine is more difficult in methods of application than with other classes of stock. The effect of swine parasitism is at the present time little understood by breeders and farmers. Further study is required, particularly further demonstration is required of the results that may be attained where proper measures of control are instituted. Most important of all, extension work is required in order that the breeder and farmer may have some definite knowledge concerning what is (to him) largely a mystery at the present time.

3. Lower growing costs by the greater utilization of:
(a) Pasture crops.
(b) Roughages.
(c) Succulents.

With high prices prevailing for the feed stuffs largely used in swine rearing at the present time and with prices for the finished product at a comparatively low level, the old problem of lowering costs of production is of peculiar significance. Your Chairman is of the opinion that further work is required with reference to the lowering of costs by the use of cheaper home-grown feeds. It is assumed, of course, that the feeder attempts to grow as much of his grain requirements as possible. Not enough data, however, are at hand at the present time in Eastern Canada as concerning pasture crops, roughages and succulents and their utilization in the growing of bacon hogs. Many claim that swine can profitably and economically consume only very limited quantities of these types of feeds. It is not clear as yet just what the maximum use may be. What quantity of roots, for example, may be fed to winter finishing pigs? What kind of roots? What methods of preparation? What effect on time required to finish? The same with reference to alfalfa hay and alfalfa meal. What effect has the greater utilization of these products on type, cost and time required to finish? Concerning the question of pasturing, which is a contentious point with swine breeders to a certain extent and admitting that much of the recommendation concerning the use of pastures comes from American sources, how does the market bacon pig react to pasturing under Canadian conditions from the standpoint of finished market type, cost of production, and time required to finish?

4. A further study concerning the correct balance or proper nutritive ratio to be observed in the successive ration changes of the market bacon hog. Concerning this point, some difference of opinion still exists. To preserve the desired market type, can the generally accepted nutritive ratio

be followed or must there be utilized a narrower ration in the feeding of the market hog?

5. A further study of causes of unthriftiness during and immediately following the weaning period. It is well recognized that this is the critical period in the feeding of the pig. It may be admitted, too, that we have in this country too great a percentage of unthrifty pigs during this period. Is this due to defective feeding? On the other hand, is it due to some lack, mineral or otherwise, in the feeding of the sow during pregnancy? Is it caused by a defect in the feeding, care and management of nursing sows? Aside altogether from the factor of feeding, is this prevalent unthriftiness due to parasitism and caused by part of the cycle of, for example, the ascarid?

6. Further investigation into methods of feeding. In the past, much work has been done with the self-feeder, and in Western Canada this feeding is coming in for consideration at the present time. The conclusion arrived at on the Dominion Experimental Farms in Eastern Canada was that self-fed hogs make greater gains, consume more feed per pound of gain and finish in shorter time than do hand-fed hogs, and that, as a general rule, the saving of labour considered, self-feeding may be more economical than hand-feeding. It has been found, however, that the type of hog produced in many cases is not the ideal of the market at the present time, or since grading was universally applied. At the present time, further work is necessary to indicate the correct rations to be used with the self-feeder with the production of a select market hog in view. According to the work recently carried out at Ottawa, the use of the self-feeder with rations comparatively narrow in so far as nutritive ratio is concerned, gives all the advantages of the self-feeding system, and produces a select market pig. More work along this line is required.

7. The effect of sunlight on proper nutrition of growing pigs. This is a problem which has received little or no consideration in Eastern Canada.

8. Investigation into and tests of commercial supplements and accessories, of which there are a number on the market at the present time selling at comparatively high prices. Several of these are of European origin. Routine tests of commercial feeds should also come in for consideration under this heading.

The foregoing suggestions include a few of what, in your Chairman's opinion, constitute problems that warrant consideration now. Of these, the matter of some system for the Advanced Registration of swine and a better appreciation and further study of swine parasitism, are, by long odds, the most important.

It may be considered by many that the suggested lines for consideration are of too practical a nature and are insufficiently scientific in their nature to warrant consideration by a Society of this kind. This is not your Chairman's opinion. After all, one of the greatest defects and one of the most outstanding requirements in every phase of agriculture to-day is not so much the accumulation of further knowledge as a *better appreciation or better knowledge of the application of what we do know, and what we have known for twenty years.*

Once more, regret should be expressed at the lack of action on the part of your Committee, this to be blamed entirely upon the Chairman. The hope is expressed that in the selection of a Chairman of this Committee for the coming year, someone may be chosen in a better position and better qualified to produce results, than has been the case in this instance.

Central Experimental Farm,
Ottawa, Ont.

REPORT OF BEEF CATTLE PRODUCTION COMMITTEE.

R. S. Hamer, Acting Chairman

During the past twelve months the Canadian market for all grades of cattle has been more attractive than at any time since 1920. Price levels have ranged from two to four cents above those which had previously prevailed during that period. In addition, they have been maintained without serious periodic fluctuations. To an industry which has struggled through so many heartbreaking experiences in recent years, the present favourable condition of the trade is admittedly a welcome relief.

While the situation is one which provides room for gratification, it cannot be claimed that it is the result of the maturing of any clearly defined production and marketing policies. It has, in fact, rather the aspect of a fortunate combination of circumstances which has materially benefited our producers, although not to that degree which might have been possible had the advance occurred in time to offset fully the effect of the collapse of the British market in 1926. Moreover, there is an element of danger in the ease with which the market now absorbs at profitable prices all kinds of cattle regardless of breeding or finish. Under such conditions there is a natural tendency to relax improvement effort, particularly in respect to feeding. This tendency has been accentuated by a somewhat general lack of confidence in the stability of the recent market and by high feed costs during the past winter. As a result, the disposition to "make hay while the sun shines" has been clearly illustrated in the character of the bulk of the cattle offered for sale during the past year.

To those who are interested in the future of our beef cattle industry, the need for a constructive policy designed to place it upon a more secure foundation is therefore just as pressing in its present period of comparative prosperity as was the case a few years ago when it seemed almost doomed to extinction. Furthermore, it admittedly should be possible to capitalize existing favourable conditions to advantage in inaugurating new policies in relation to marketing and production.

Fortunately preliminary action to this end was taken early in 1927 and, as is no doubt known to most of the members of this society, a joint beef committee was appointed by producers east and west in conjunction with the federal and provincial departments of agriculture to inquire into the possibility of developing our domestic market. The report and recommendations of this committee are to be presented for discussion at a Dominion beef cattle conference in Winnipeg on June 28th and 29th. As this conference will be representative not only of producers' organizations and of the various

departments of agriculture but also of retailers and packing interests, it will undoubtedly be the most important meeting which has as yet been held in Canada for the sole purpose of discussing problems relating to our beef cattle business. Your committee feel, therefore, that the objective of the conference should be brought to the attention of this society and in order to do so as accurately and as concisely as possible, quote in part the announcement which was issued a month ago in regard to it, as follows:—

> "It is clear that the domestic market which absorbs 85% of the cattle annually disposed of in Canada is by far the largest and most important outlet. It has capacity which is at present being curtailed as a result of the unpalatable character of much of the beef offered for sale. It should provide continuous encouragement to the producer of good cattle but it is instead functioning primarily as a clearing-house for beef below export standard. It seems to stand in need of some machinery which will make it possible for consumers to exercise an intelligent discrimination as to quality and values. If the consumer can be assured that he will receive the quality of beef for which he is prepared to pay, the producer will in turn be given confidence that he will be paid for the quality which he produces.
>
> It is hoped that a plan agreeable to producers, to consumers and to the trade providing for the grading of beef for the domestic market will develop out of the discussion at the conference. With this accomplished, it should then be possible to relate export requirements to those of the home market and to build a national production policy which all interests can get behind in promoting the breeding and finishing of cattle to suit these requirements.
>
> There is no question that Canadian farmers can produce cattle of the desired quality if reasonable assurance of an attractive outlet can be given. If the home market can be made to provide the initial incentive, the industry will be placed in a position to take the fullest advantage of export opportunities as they occur. A high standard of quality combined with continuity and volume of supply are fundamental essentials in holding export markets. It is of paramount importance, not only to Canadian producers but to the revenues of the country, that the present favourable situation in the beef industry be capitalized to develop to the maximum its potentialities as a source of supply for the world's markets."

It will be noted that whereas in the past the export market either in the United States or in Great Britain has been largely relied upon—and sometimes with disastrous results—to provide the primary incentive to improvement and finishing of our beef cattle, it is now proposed to endeavour to develop capacity in our home market to reward through proper price differentials the production of good quality cattle. Experience in the case of the beef trade as well as in that of other products has demonstrated that improvement in quality can be attained only in the degree to which market outlets can be made to encourage it. While it is not to be expected that our domestic beef trade can be revolutionized in the course of a year or two, there is every reason to anticipate that at the Winnipeg conference the inauguration of a voluntary grading system at a definite date will be agreed upon. Investigations carried on during the past eighteen months warrant the assumption that if the grading is efficiently done,—in other words, if the beef which is stamped continuously commends itself through its eating qualities—the consumers' response will be prompt. It may easily be so insistent as to break down the whole scheme through the scarcity of supply if production activity is not focussed on this prospective outlet in time to avoid such a contingency.

It is clear, therefore, that if a more constructive policy in relation to the marketing of beef is to be undertaken successfully, it must be paralleled by a well organized production policy. As a number of the members of the Eastern

Canada Society of Animal Production will have an opportunity to contribute to the discussion at Winnipeg and as many others will be directly interested in giving effect to the recommendations of the conference, it is felt that attention should here be centred upon one production problem which is of particular commercial significance at the present time and which cannot be solved fully until further information is available.

In order to appreciate the importance of some phases of this problem, it is necessary to recognize the fact that in the past Canadian beef producers have paid but slight attention to the requirements of our domestic market. With the exception of a small annual output of milk fed baby beef which has gone into a limited high class trade, our good cattle both grain fed and grass finished have for the most part been produced with the export market in view. Very little good quality beef has gone into the trade which caters to the mass of Canadian consumers. As a result, it is entirely probable that if our home market is to be successfully developed as an increasingly important factor in the absorbing of our best cattle, it will be found necessary to modify our production policy in part at least.

The initial difficulty grows out of the nature of our domestic brand. Aside from the question of price, the points most widely emphasized in the Canadian consumer's beef purchasing for some time have been the size of the cut, tenderness, and absence of excessive fat which in the majority of households represents so much waste. The light weight carcass has been the popular one and the effort on the part of the trade to satisfy this requirement has resulted in prices being paid for undersized, poorly finished steers and heifers entirely out of line with the prices realized for good cattle. While such carcasses cut up conveniently into the small cuts which are so much in demand and while they are assuredly lean enough, it must be admitted that much of this beef is not very desirable from the eating standpoint.

If the 400 to 500 lb. carcass continues to hold its present position of popularity, it is evident that it can only be supplied in the form of real beef by marketing our cattle in proper condition under twenty-four months of age. This implies carrying the calves forward to marketing age without material loss of flesh in any stage of their development. To be possible of general application, any practice advocated might have to be divorced from that generally followed today in the production of milk fed baby beef. It is scarcely to be expected that prices could be maintained at a level which would permit of a wide expansion of what is generally conceded to be a somewhat specialized high cost type of production under eastern Canada conditions. It is probable, however, that access to grain when on pasture as well as in winter months would be an essential to the development of a growing trade in high quality beef. This would, of course, involve a material change in beef production practice in Canada and before it could be widely advocated, we should have available more information than we have at present as to beef production costs. We are deplorably lacking in data of this nature and there is a real need of extensive surveys to determine the cost of raising and finishing a steer under varying farm conditions in eastern Canada and to ascertain at what age he can be most profitably marketed.

Under a grading system, it may, of course, be found possible to cultivate a real appreciation of flavour, which is to be found only in the more mature animal. There is some evidence to justify the hope that this will be one of the most important results of the introduction of grading. Should it prove to be so, it will undoubtedly be a most acceptable development from the standpoint of the producer as the two-year-old steer has long been the standard feeder either to go into the feed lot or to be finished on grass. In theory, it may seem that it is not economical to raise a steer to two years of age before finishing him. The trade may also be justified in claiming that the best beef cannot be obtained from a steer which has been carried through two winters on rough feed before being grain fed or finished on grass. It is nevertheless a fact that the two-year-old has been generally regarded by cattle feeders as being better adapted than the younger animal to the utilization of what would otherwise be waste feed and to putting on economical gains during the finishing period. It is probable also that with some modifications in practice involving particularly feeding of grain on grass, the majority of our cattle feeders could be depended upon to make a better job of finishing two-year-olds than would result from an attempt to convert general practice to one of turning off finished yearlings. In any event, it is a source of satisfaction to know that packers will be definitely interested in helping to carry consumption into as heavy weights of cattle as possible because they prefer to handle the heavier classes.

Until it can be demonstrated whether our home market can be induced to absorb increasing quantities of good quality beef from carcasses weighing up to 600 or 650 lbs., it will, however, be necessary at the outset to pay special attention to the existing demand for carcasses of lighter weights. But before this demand can be interpreted with safety and with confidence in relation to a production programme it is essential, as already pointed out, that information bearing on comparative costs of production under farm conditions be obtained in sufficient volume to admit of reliable conclusions being drawn. If it can be successfully demonstrated that high quality, light weight beef which will consistently command the top price on our market can be economically produced by the average farmer, it will be only good business to attempt deliberately to turn our production more and more into that channel.

There is another important factor in regard to beef marketing under conditions in eastern Canada upon which cost of production has an important bearing. As is well known, dairying has replaced the beef industry in all of our eastern provinces to such a degree that in the majority of cases the farmer who wishes to feed cattle is now practically faced with the necessity of either growing his own feeders or of bringing them in from western Canada. There has been a growing impression that except under buoyant market conditions such as have existed during the past year, feeder cattle cannot be economically raised on the higher priced land in eastern Canada even from cows paying their own way at the pail. As a result, the annual movement of feeder cattle from the markets in western Canada and from the range areas to pastures and feed lots in the east has steadily increased in volume.

For the past two or three years, however, American competition for the best of our western feeders has been so keen that only the more optimistic of our eastern cattle feeders have felt justified in paying the prices necessary to secure them. A large percentage of the feeder cattle which have been shipped east on consignment or for sale during that period have consisted of cutbacks from one or more sortings on the different western yards. It should be borne in mind in this connection that if the capacity of our home market is developed as an outlet for good beef to the degree which we are hoping it will be, the finishing of cattle will be undertaken on an increasing scale in western Canada. Regardless of anything which might happen to curtail American feeder demand, the eastern buyer will therefore likely have to continue to pay strong prices for well bred young western feeders.

It is just posible that in many parts of eastern Canada feeder cattle of much better quality could be produced at lower costs than the prices paid for second or third grade westerns. There are several districts in Ontario, a number in Quebec and large areas adjacent to the salt marshes of Nova Scotia and New Brunswick in which beef cattle could be cheaply finished but in which there is no supply of feeder cattle available. Whether, in relation to a strong and stabilized market, beef production in such districts could be best developed by growing young feeder cattle locally or by relying upon western Canada as a source of supply, could be determined only through a comprehensive study of production costs.

It has seemed to your committee that the question of production cost is so fundamental in relation to all prospective developments in regard to our beef industry that their report for this year should be limited to consideration of that factor. The various phases of the question which should be the subject of investigation and farm survey work may, for convenience, be itemized as follows:—

(1) The cost of raising to ages of 12, 18, 24 and 30 months, respectively, of feeder cattle, using cheap roughage with and without succulent feed in winter and cheap or rough pasture in summer, the cows paying their own way through milk production.

(2) Costs involved in the most economical methods of finishing in winter months steers of the various ages referred to in (1).

(3) Costs involved in the most economical method of finishing with grain on pasture steers of the above ages.

(4) Cost of raising baby beef suckled during the early months and marketed at various ages with a view to determining the most economical method of handling and most profitable age at which to market.

(5) Cost of raising young cattle which have had access to sufficient grain at all stages to retain their natural flesh and produce a high quality carcass when marketed at weights ranging from 700 to 1050 lbs.

Dominion Live Stock Branch,
Ottawa, Ont.

REPORT OF HORSE PRODUCTION COMMITTEE.

C. M. MacRae, Chairman

The report which I propose to give, being the first one, will deal to a certain extent with the present status of the horse industry in Canada, particularly Eastern Canada and with some of the departmental work that has been carried on for several years, as well as with policies recently inaugurated. Practically all of the foregoing policies are under the supervision of one or other members of the committee.

In January, 1927, following the organization of this Society, I endeavoured to arrange a meeting of the whole Committee in Toronto during the week of the Breeders' meetings in February. Unfortunately Messrs. Gautreau, Langelier, and Cumming were unable to attend. Messrs. Fowler and Wade, however, were in Toronto and spent the morning discussing various phases of the horse industry. Amongst other things taken up might be mentioned diseases and hereditary unsoundness which were discussed at some length, stallion inspection and the changed conditions in Eastern Canada as regards horse breeding and the question of what might be done to revive the old interest in breeding, particularly in the Province of Ontario. Some of the projects mentioned later and which are now actually in operation were discussed at that meeting. In fact Messrs. Wade and Fowler were both closely identified with some of these policies.

In January, 1928, it was found to be practically impossible to arrange a full meeting as Dr. Cumming had left the Truro Agricultural College, while Dr. Langelier was just recovering from a serious accident. Accordingly it was decided to ask all members to attend the regular meeting of the Society which is being held here today.

Status of Industry.

The horse population according to the census of 1901, was 1,577,000 odd. In 1911 it had increased to upwards of 2,598,000, while the 1921 census showed a population of 3,451,750 horses. Thus there was a steady average increase for the 20 years of approximately 95,000 horses per year. At the outbreak of war, Ontario had a horse population of over 900,000. The census of 1921 showed the population to be 669,000 or a decrease of over 230,000 head. Quebec for the decade 1911-1921 showed a small increase of just over 2%. New Brunswick's increase was approximately 3¾% while Nova Scotia decreased 3¼% and Prince Edward Island lost 8¼%. On the other hand Manitoba had a gain of approximately 88,000; Saskatchewan 590,000; Alberta 420,000 and British Columbia 12,000. Thus it was not to be wondered at that beginning about 1923, large numbers of horses have been shipped eastward to Ontario, Quebec and the Maritime Provinces to supply the demand where formerly about 10,000 yearly were sent westward to the Prairie Provinces. During the last two calendar years close to 19,000 horses per year were shipped from the west to the east and the demands this last winter and spring are reported to be greater than at any previous time. As might be expected prices were also up approximately 25%. This shortage in the east has had the effect of causing the breeders to see the necessity of raising more horses on the farms. Accordingly there

is more breeding being done during the last two years than at any time since 1914.

Departmental Policies.

Various policies and societies are now in operation, which are helping the horse industry. The Club Policy, inaugurated by the Dominion Live Stock Branch, and which came into operation in 1915, was never popular in Ontario or for that matter in Quebec or the Maritime Provinces. It was claimed that conditions were such that it could not be successfully operated. The real facts are that the eastern horse men were not prepared to co-operate freely in establishing community breeding and particularly in sticking to one breed. On the other hand the policy has been popular in the Prairie Provinces and breed associations have freely admitted that it was the means of enabling the breeders to carry on during the hard years.

Two years ago the Provincial Department of Agriculture for the Province of Quebec approached the Dominion Live Stock Branch requesting that it join on a fifty-fifty basis to bonus good, sound stallions, standing for service for the members of county agricultural societies. A policy was finally worked out which, though by no means perfect, is proving beneficial.

Last January the Ontario Department of Agriculture made a similar request and a new policy has been inaugurated which will become effective this year, to pay premiums to the owners of A1 stallions standing for service in the Province, and that comply with certain regulations. Similar requests have also been received from Nova Scotia and Prince Edward Island and policies to suit conditions are being worked out. It is hoped that New Brunswick will join the others at an early date. These policies make it possible for an owner to stand a good stallion for service in a district at a reasonable fee, as it is possible to earn up to $300.00 as a premium in a season.

Breeding Stations.

In 1921 the Dominion Live Stock Branch started what is known as a Breeding Station Policy for the encouragement of the breeding of saddlers, hunters and horses of that type. It is a well known fact that a good, big saddler or hunter, makes an excellent remount, fire, police,or light delivery horse, or to work on the farm. This policy provides for the paying of a bonus to the owner or proprietor of a station, in a suitable district, who stands three or more big, thoroughbred stallions of the cross-country, hunter type for service. The first station was started at Roddick Lake, Quebec, in 1921. The following year stations were started at Chaffey's Locks, Ont., and Millarville, Alta., while four additional stations followed at Ailsa Craig, Ont., Brampton, Ont., Russell, Man., and Kamloops, B.C. At the present time twenty-five stallions are standing for service at these stations. Stations in the other provinces would have been started had it not been for the scarcity of good, big thoroughbred stallions of suitable type. The colts obtained from breeding these stallions to the ordinary grade mare of the country, weigh from 1,200 to 1,400 and even 1,500 pounds, have been very satisfactory indeed. Colts that are likely to make hunters or good saddlers, with practically no training, are bringing from $250.00 upwards, while horses that have been trained have been sold for from $1,000 up to $5,000 per head.

So great is the demand that many of the likely two-year-olds and even yearlings have been readily picked up.

The Racing Association of Ontario, composed of five Jockey Clubs, has done much to encourage the breeding of saddlers and hunters. This association began in 1922 by importing from Great Britain and the United States some fifteen stallions which they are loaning to Breeding Station proprietors or private individuals in suitable districts. These horses are shipped out about the first of May from the Woodbine Track, Toronto and are taken back there about the first of October, where they are kept and conditioned throughout the winter to be ready for the next season's work. In passing it is hoped that other Racing Associations will do likewise as there is a great shortage of suitable stallions which are so badly needed today in Canada.

Hunter Improvement Society.

A couple of years ago a few enthusiastic horse lovers in Toronto and district got together and organized a Hunter, Saddle and Light Horse Improvement Society. It was only this last winter, however, that real progress could be reported. Early in the year the Dominion Minister of Agriculture authorized a grant of $5,000 to the Society in order that it might get started with practical work. The Province of Ontario also subscribed $2,000, while several private members signified their willingness to each contribute $1,000 for the purchase of good stallions to be placed in suitable districts. Other members contributed various sums to be used as prizes at various shows for mares suitable for the raising of saddlers and hunters by thoroughbred sires and also for foals the get of thoroughbred sires. The Dominion Department of Agriculture has a representative on the executive of the society and likewise the Ontario Department of Agriculture, while Vice-Presidents have been named for Quebec and the Western Provinces. Provision is also made for the forming of sub-committees in each of the other provinces as soon as the province sees fit to make some contribution towards the Society and is prepared to organize to carry on the work. Amongst other activities, the Society is prepared to conduct a Stud Book, first for the registration of foundation mares and their progeny and later of suitable stallions that have sufficient thoroughbred blood to warrant their being used as sires. In short, with due respect to conditions, the work of the Society will be much the same as that carried on by the Hunter Society in Great Britain or in Ireland. The Irish hunter is world famous and his fame has been a source of profit to his breeders.

The opportunity in Canada of producing a famous Canadian hunter is equally good while the market is, if anything, better. Canadian hunters and saddlers have always been popular in the United States and never more so than at the present time. Riding and hunting are on the increase while prices never were better. As an example, some of the horses bred at Roddick Lake Station and now in the United States cannot be bought for $7,000, $8,000 and even up to $10,000. Considering the foregoing facts it may be said that horse breeding is now building from a rock foundation and the next ten years will show a wonderful increase and improvement in the horse industry.

Already nearly 600 mares have been inspected as foundation stock for the Hunter Stud Book and it is hoped that it will be possible to get at least 1,000. It is also hoped eventually to be able to register stallions carrying several crosses of thoroughbred blood and whose size and conformation warrant. This has already been done in the Irish Hunter Book.

There is another matter on which it is hoped some work may be done during the coming year. At the present time each of the nine Provinces of Canada has a stallion enrolment law but there is little uniformity. It would be in the interests of horse breeding if these laws were uniform. Your committee plans to bring the matter to the attention to the Provincial Departments of Agriculture of the five Eastern provinces in the hope that eventually a uniform law may be passed by each.

At the present time there is need for educational work amongst the breders, not only in the matter of the types of horse required by the markets but particularly as regards the feeding, care and management of mares and also of the colts. If proper feeding methods as well as management had been adopted a couple of decades ago, Canadian horses would be much better than they are today. It is all very well to use good sires but it is even better to mate them to mares of good conformation, that are sound and in healthy breeding condition and that are kept so until the foal is born. Then it becomes a matter of taking care of the foal. The first year is the most important of his life, while the second year is second in importance, and so on until he is full grown. It is the lack of care and feeding that leaves so many undersized horses with bad feet and faulty in conformation. In this alone there is room for much educational work.

The matter of hereditary unsoundness is something that does not seem to be understood by the average breeder. The fact that these are likely to pass on from sire and dam to the off-spring is not seriously considered by the average breeder. Hence it is that there are so many unsound horses in the country today. If this were brought to the breeders in such a way that they would understand the need of using sound sires and dams it would be a long step forward in the improvement of our horses.

In the matter of advertising and collecting data, up to the present time little work has been done. On the other hand trucks and tractors have been widely advertised to the detriment of the horse. It is time that authentic statistics were collected and published. These would prove beneficial not only to the breeders, but to the country at large.

Dominion Live Stock Branch,
Ottawa, Ont.

REPORT OF THE GENERAL SECRETARY,

Presented at the Eighth Annual Convention, C.S.T.A., Quebec, June 11, 1928.

Fred. H. Grindley

Once more it is my pleasure to submit to the members a report of the Society's activities for the year which has recently closed. During that year there have been more than the usual number of developments, all of which have brought about a greater measure of stability. I am sufficiently familiar with the nature of the retiring President's address, which you have just heard, to know that it contains a reference to practically all of these developments. I hope I may be pardoned if I deal with them in rather more detail. It is also necessary for me to embody in my report this year more than the usual amount of statistics, particularly in dealing with the financial statement and these, I hope, you will not find uninteresting. In other respects the report will not vary greatly from the reports which have been presented in previous years.

Membership

A year ago, on June 1st, 1927, the total membership of the Society was exactly 1,000, made up of 987 regular members and 13 student members. During the past year, the names of 82 regular members were removed from the membership list, either because of resignation or for non-payment of fees and 90 new regular members were admitted. I regret to report the loss of 6 members through death: John Fixter on August 9, 1927; F. G. Gale, the latter part of November, 1927; Earle C. Hatch on November 19, 1927; P. C. Powys on November 24, 1927; Professor Wade Toole on January 12, 1928 and Victor Matthews on February 13, 1928.

The present number of regular members is therefore 989. Three of these, B. L. Emslie, L. S. Klinck and F. H. Grindley, have become life members by making a contribution of $100.00. The number of student members (senior students), however, has increased considerably, being 34 this year as against 13 last year. The total membership on June 1st, 1928, was therefore 1023 as compared with 1,000 on the same date in 1927.

I should like to emphasize two features in connection with membership. The first is that the collection of fees has been much more rigidly carried out than in previous years and members who were deliberately lax in payment and at the same time obviously skeptical as to the permanence and usefulness of the Society were promptly removed from the membership list. This has resulted in the encouraging fact that on June 1st, 1928, 94% of the members were fully paid up and not a single member was more than twelve months in arrears.

The second feature is that no wide-spread membership campaign was undertaken during the year. It may, therefore, be taken for granted that the present membership can be maintained quite easily and can be increased at any time by means of a carefully organized campaign.

There have been noticeable increases in membership in the locals of British Columbia, New Brunswick and Macdonald, and slight decreases in

Manitoba, Prince Edward Island, Montreal and North and South Saskatchewan. The present distribution of membership is as follows:—

Alberta, 108; British Columbia, 85; Manitoba, 74; New Brunswick, 36; Nova Scotia, 35; Eastern Ontario, 122; Northwestern Ontario, 8; Western Ontario, 135; Niagara Peninsula, 31; Prince Edward Island, 8; Macdonald, 68; Montreal, 77; Quebec, 65; Ste. Anne de la Pocatière, 36; Northern Quebec and Ontario, 16; North Saskatchewan, 44; South Saskatchewan, 42; British and Foreign, 33.

"Scientific Agriculture"

Probably the greatest step taken by the Society during the year was the change made in the size and form of its journal in September, 1927. Following a resolution passed at the 1927 convention and in consultation with a special committee named by the Dominion Executive, the present form of the journal was decided upon. It was discovered, however, that the change in quality of paper and an increase in the number of pages would involve a new expenditure of nearly $4,000 per year, which the Society could not afford to make.

An appeal for financial assistance was therefore made to the Federal Department of Agriculture, the National Research Council, the Provincial Departments of Agriculture and the Agricultural Colleges. The total amount solicited from all these sources was $3,900, and the amount contributed fell short of this objective by about $800. The Society, however, has been able to meet part of the increased cost of the journal out of its own funds and can at least continue to do so until the current volume is completed in August, 1928. At that time the publication of future issues will depend entirely upon a continuation of the financial support received during the past year, which is acknowledged on the front cover of each issue of the journal.

Two noticeable results followed the change in the style and size of the journal. The first was the spontaneous approval which the new journal received from scientific circles, not only in Canada but throughout the world. In its present form it is plain that *Scientific Agriculture* is accepted as a contribution from Canada to agricultural research and experimentation. Many new subscriptions have been received from distant countries and copies of several of the issues are already entirely out of stock.

The second effect of the change was the rapid increase in the number of manuscripts submitted for publication. The average number of pages per volume in the first seven volumes of the journal was slightly less than 500 and it was always difficult to obtain an adequate supply of suitable material. The current volume will contain over 800 pages and there are always enough articles on hand to take care of two or three issues in advance.

There are still criticisms from certain members as to the technical nature of the magazine and plain statements that, apart from the C.S.T.A. news items, it is uninteresting. It seems to me that the purpose of the Society's journal is, or ought to be, to provide a creditable medium in Canada for the reasonably prompt publication of articles which contribute to our knowledge of agriculture. If that is its purpose, then I see little need for criticism.

My only suggestion is that, if finances permit, a slightly better quality of paper be used so that illustrations may be reproduced more satisfactorily.

Permanent Clerical Assistant

Between 1920 and 1927 the expenditures for stenographic and clerical assistance at the central office never exceeded $300 per year. Finances would only permit the employment of such assistance at rare intervals. With the increase in the volume of work to be done, this condition became almost intolerable. Relief finally came during the past year when a grant of $600 from the Chilean Nitrate Committee permitted the employment of a permanent clerk-stenographer on September 1st, 1927. This appointment has done much to promote efficiency at the central office, it has permitted the General Secretary to leave Ottawa more frequently in connection with advertising and to attend more meetings of local branches. I am confident that the routine work alone at the central office could not be performed without this assistance and the members should gratefully acknowledge, not only the donation which made the appointment possible, but the splendid manner in which Miss Henry has carried out the duties assigned to her.

The T. Eaton Company Scholarships

Between November, 1927, and January, 1928, a series of interviews with the T. Eaton Company Limited of Toronto, resulted in the awarding of five annual scholarships of $600 each, open to C.S.T.A. members and tenable at Canadian Universities, the scholarships to be available in 1928, 1929 and 1930. In this connection, I want to acknowledge the assistance rendered by Dr. J. B. Reynolds, Dr. J. H. Grisdale and Dean H. Barton, who attended meetings with the donors and did much to expedite their decision. I wish also to record my personal appreciation of the cordial manner in which the proposal was received by the T. Eaton Company and the appreciation of the entire membership for the generosity of their gift.

Applications for the T. Eaton Company scholarships were received by the General Secretary from 36 members between February 15th and May 31st, 1928. The following committee was appointed by the Dominion Executive to consider these applications during the Convention:—Dr. Robert Newton, University of Alberta, Chairman; Mr. F. Pugh, representing the T. Eaton Company, Limited; Dr. D. L. Bailey, University of Toronto; Dr. G. P. McRostie, Mr. L. H. Newman and Dr. A. G. Lochhead of the Central Experimental Farm; Professor A. W. Baker, Ontario Agricultural College; Professor Gustave Toupin, Oka Agricultural Institute and the President or General Secretary of the Society. The decision of this committee will be announced on June 13th.

Grant From International Education Board

At a meeting of the International Education Board (Rockefeller Foundation) held in New York City on February 24th, 1928, a sum of $4,000 was voted to the C.S.T.A. This donation was made for the purpose of financing a survey of the graduate and research facilities available at Canadian Agricultural Colleges, as well as in the Federal and Provincial Departments of Agriculture, and in preparing and publishing a Graduate Calendar based upon this survey.

This grant resulted from a recommendation made by the C.S.T.A. Committee on Graduate Study in 1926. The International Education Board was approached in November of that year, but was unable to consider the matter until the following year.

Incorporation

At a meeting of the Dominion Executive held in Vancouver on June 18th, 1927, the General Secretary was instructed to proceed with the matter of incorporation. As a result the Society will become incorporated under Dominion Charter within the next few weeks.

Bureau of Records and Employment

The work of organizing this Bureau was proceeded with to the extent of collecting, during the year, a complete and up-to-date record of the professional experience and academic training of every member. Those who wished to register in the Employment Bureau were invited to do so without charge. An effort was also made to group the members into those branches of agriculture in which they were especially interested. As a result of that work, it was possible to publish a new List of Members in May, 1928, with their titles and addresses and to indicate the membership of some of the major groups. It should also be possible—again, if finances warrant it—to publish a second edition of the C.S.T.A. Who's Who during the coming year.

It is strongly felt in some quarters that the Society should take more part in the appointment of agricultural graduates to various positions and in encouraging the employment of graduates in as many fields as possible. While this would involve considerable new clerical work and necessitate the appointment of a qualified and responsible Board of Directors, or some such body, I believe a definite step should be taken in that direction. Progress might be slow, but the groundwork has already been laid and a certain amount of publicity might lead to surprising results. I merely throw out the suggestion to the incoming Executive that the Society might very well act as a medium between employing institutions seeking trained men and men seeking employment or advancement. A practical field of work lies in this direction.

Local Branches

The local branches seem to have been more active than usual and a large number of meetings have been held during the year. The members should be familiar with the work of their respective locals and no reference to it is necessary in this report. It should be stated, however, that several branches have asked whether it would not be possible for the Dominion Executive to outline one or more projects for the consideration of local branches so that these branches would feel that they had a definite programme to follow and concrete work to perform. This matter will be considered by the incoming Executive.

I have to report the organization of a new branch in Northern Quebec and Ontario, bringing the total number of branches to seventeen. The new branch already has a membership of sixteen, with excellent prospects for an increase in membership during the coming year.

Travelling

During the year the General Secretary has attended meetings of the following local branches: British Columbia, North Saskatchewan, Manitoba,

Northwestern Ontario, the new local in Northern Quebec and Ontario, Niagara Peninsula, Western Ontario, Eastern Ontario, Macdonald, Montreal, Quebec, Ste. Anne de la Pocatière and Nova Scotia. The usual amount of travelling in Ontario and Quebec has been necessary in connection with advertising.

Finances

And now I come to the matter of finances, always one of major importance. I have placed in your hands a statement showing the receipts and disbursements during the year and I would ask you to refer to it during the reading of this part of my report.*

The chief feature of this report is that the cash balance of $2,155.18 with which we closed our books on May 31st, 1927, has been turned into a cash balance of $2,615.61, and an actual credit balance of $2,276.59 a year ago has become a credit balance of $3,378.53 on May 31st, 1928. This shows an operating surplus of $1101.94, in spite of heavier overhead operating expenses. It should be borne in mind, however, that there will be twelve complete issues of the new journal to be paid for during the coming year as against nine (September to May) in the year just closed. The costs of incorporation, whatever they may be, have yet to be paid and this will be a charge against next year's operations. While these facts do not affect the surplus of last year, they make it plain that such a sulplus may be of considerable value during the year now starting.

As compared with the report of last year, there have been increases in receipts from membership fees, subscriptions, text books and reprints, with slight decreases in receipts from advertising. On the expenditure side of the balance sheet there is a heavy increase in the items for printing, for cuts and for postage, due entirely to the change in the journal and practically balanced by the grants received. An increase in the cost of clerical assistance is balanced by the Chilean Nitrate Committee grant, donated for that purpose. There were no other increases in expenditure as compared with last year, and there were no decreases in expenditure.

On the whole, the report is about the most satisfactory and most encouraging in the history of the Society and we can start out on our ninth year with that feeling of financial security which has often been lacking in past years.

It is interesting to note that of the total revenue of $15,801.35 (total receipts less credit brought forward) received during the past year, the amount received from the members in fees, including applications and renewals of membership, was $4,427.85, or slightly less than thirty per cent of the total operating costs. This is a sound argument to advance to any member who still considers that the fees of the Society are too high, and is proof of the statement that everything possible is being done to give to the members as low an annual fee as possible. So much for the financial statement.

* A copy of the annual financial statement may be obtained from the General Secretary on request.

The Eighth Annual Convention

Plans for this Convention were initiated by the Quebec local branch as far back as August, 1927, and have been developing since that time. Practically all of the organization work has been done by the retiring President and by the Committees named in the Convention programme; special mention should be made of the Chairmen of these Committees, Messrs. Savoie, Magnan, Maheux and Cloutier, who have held frequent meetings during the past few months. Grateful acknowledgement is also due to the Quebec Department of Agriculture, the Dominion Department of Agriculture, the members of the local branches in Quebec, the Agricultural School at Ste. Anne de la Pocatière, and the Dominion Experimental Station at Cap Rouge for complimentary luncheons, banquets and other forms of hospitality. Special mention should again be made of the assistance given by the Dominion Department of Agriculture in making possible the series of lectures included in the programme.

New Officers

Ballots for the annual elections were mailed to all members on April 10th and were opened at Ottawa on April 30th. 713 members voted. The following official results were announced to the Canadian Press on that date and published in the May issue of *Scientific Agriculture*:

President—E. S. Archibald.
Vice-Presidents—A. T. Charron (re-elected), J. P. Sackville.
Honorary Secretary—L. H. Newman (re-elected).

Meetings of the Dominion Executive Committee were held at Vancouver, B.C., on June 18th, 1927, and at Quebec on June 11th, 1928. A special meeting of the Executive Council was held in Toronto on November 18th, 1927.

I know of nothing further that need be reported at this time. Your Society is in good condition financially, its members are becoming more enthusiastic and recognition is being received from an increasing number of sources. To make predictions as to the future is not the purpose of this report. I would like to suggest, however, that if some means can be found for providing more adequate headquarters for the Society and for ensuring a measure of financial stability, and ultimately complete independence, the development of the organization would be greatly accelerated.

Before closing this report I want to extend my personal acknowledgement to the members of the Dominion Executive, the various committees, and particularly to the local branch secretaries for the splendid support and counsel which they have given during the year. I should also like to acknowledge the assistance given by Professor Nagant, particularly in maintaining the French section of the official journal.

I beg, Sir, to move the adoption of this report and at the same time, I move that as soon as possible the assets and funds of the Canadian Society of Technical Agriculturists be transferred to the Canadian Society of Technical Agriculturists, Incorporated.

REPORT OF THE C.S.T.A. RESEARCH COMMITTEE.*

G. P. McRostie, Chairman

The research committee has had only one formal meeting during the past year. In spite of this fact, however, it has not been inactive. The chairman has interviewed the various members of the committee separately and has discussed at some length the subject matter contained in the present report.

The first item which the research committee wishes to refer to is the disposition of the lists of experimental projects reputed to be under investigation at the various agricultural colleges and experiment stations in Canada, As you are doubtless aware a great deal of time and energy has been expended in an endeavour to complete the compilation under discussion. In spite of the best efforts of the committee it is realized that the lists as now constituted are still far from being complete or absolutely correct.

It is the opinion of the committee that only a personal interview with the various experimenters will avail in bringing the lists up to the desired state of completeness and accuracy.

The April number of *Scientific Agriculture* contains an announcement to the effect that the International Education Board of New York founded by J. D. Rockefeller Jr., has placed a sum of $4,000.00 at the disposal of the C.S.T.A. for the purpose of making a survey of graduate and research facilities available at Canadian agricultural colleges and in the Federal and Provincial departments of agriculture. Dr. Robert Newton of the University of Alberta is being released next January for the purpose of carrying out the survey referred to.

In view of the foregoing announcement the committee has turned over to the Secretary of the C.S.T.A. the lists of projects with the suggestion that Dr. Newton, in addition to his survey of graduate and research facilities, endeavour to correct the sins of omission and commission in the lists of experimental projects as they now stand so that by the next annual meeting they might be in a condition to be of the greatest benefit to the members of the C.S.T.A. interested in experimental work.

The next item that the Committee wishes to present for your consideration is one that has received considerable thought and for which we bespeak the earnest consideration of the representatives of the C.S.T.A. at this meeting. We refer to the old but ever present problem of the co-ordination of the various phases of agricultural research.

In the first place we wish to disabuse your minds of any fears that we are contemplating bringing into being, new and complicated machinery for the carrying out of our ideas. Such is not the case.

What organized research in agriculture needs today is an agricultural spectroscope. The essential feature of the spectroscope is the prism. By means of this prism white light may be separated into its component parts. Conversely the component parts when properly focused by the prism produce white light.

*Presented at the Eighth Annual Convention of the Canadian Society of Technical Agriculturists, Quebec, P.Q., June 11, 1928.

The white light is agricultural truth; some of the rays from which it comes are in their various ramifications, Agronomy, Animal Husbandry, Botany, Horticulture, Entomology, Agricultural Engineering and Economics, Physics, Chemistry, Geology, Meteorology, and the Biological sciences. Even departments of knowledge whose relationship to agriculture is not distinctly apparent may have a very vital bearing on agricultural truth, just as the infra red and ultra violet rays of the spectrum though invisible have their important parts to play.

It is quite possible that some of our agricultural problems whose solution is yet in the rickety condition of uncertainty need but the vitalizing touch of these ultra and infra portions of the agricultural spectrum to restore them to the perfect health of certainty.

Remove any of the ingredients of white light and no matter how perfect the remaining parts are, or how true the prism, white light will not result. Similarly a single phase of agricultural research, no matter how well organized or how perfectly equipped, can never attain to the white light of agricultural truth unless the associated phases of agriculture are working at the same time in their representative capacities.

Still holding to our simile of the prism we find that it is very difficult to find the exact line of demarcation between the various prismatic colors. The central portions of each ray may be readily distinguishable but the borders overlap and intergrade with the adjacent rays. Similarly the various phases of agricultural endeavour although separate in their entirety are undistinguishable in their border activities.

The C.S.T.A. is the only fully representative agricultural organization in Canada today. Why should its executive body not function as our agricultural spectroscope?

The suggestion of the research committee is that the executive of the C.S.T.A. include in their duties the providing of facilities for the focussing of the investigational resources of the various phases of agriculture on our agricultural problems.

Requests for the consideration of problems might well come through the research committee in so far as special research is concerned, or through any other representative body who wished to concentrate the full resources of agriculture on a problem of general interest and economic importance.

Central Experimental Farm,
Ottawa, Ont.

C.S.T.A. RESOLUTIONS.

The following resolutions were passed at the Eighth Annual Convention of the Canadian Society of Technical Agriculturists held at Quebec in June, 1928:

1. That the sincere thanks of the Society be extended to all those who have combined to make this the most successful convention yet held. Here we have found the background of nature and history supplemented by so many evidences of that gift of chivalry and hospitality which are a traditional part of the people of Quebec. It is difficult to mention specifically all those to whom thanks are due, but special appreciation is hereby extended for the generous financial provision made by the Department of Agriculture of the Province, including the arrangements for the splendid banquet being tendered in their name, for the plans and personal efforts of the officers and members of the local branches and Dominion Experimental Farms, for the hospitality of the Agricultural School and Classical College at Ste. Anne de la Pocatière, for those who supplied and orgainzed the automobiles. Consideration, foresight and efficiency have characterized the local activities in every detail and the sincere appreciation of this Society is hereby extended to all.

2. That this Society express its conviction that research work is one of the important problems before scientific agriculture at the present time, and feels that it can render a service to this work by utilizing its organization for promoting and co-ordinating activities of this nature. This Society, therefore, desires to make it known that it will be glad to co-operate with all organizations, commercial or otherwise, which desire to aid in this phase of its development. Accordingly, we wish to extend a hearty expression of thanks to the T. Eaton Co., Ltd. for the generous provision which they have made in establishing five annual scholarships of $600 each for a period of three years. We beg to assure the Company that their action and their example will be most helpful in the furtherance of this important work.

3. That a change be made in the procedure incidental to the installation of the President of this Society. Accordingly, we recommend that the present President continue in office until the close of the next Convention, installing his successor at the last session of such convention and that each President thereafter be installed at the closing session of the Convention following his election.

4. Inasmuch as the educational programme of our annual meetings is of basic importance to the success and usefulness of the Society, we desire to acknowledge with thanks the action of the Federal Department of Agriculture in providing for a series of lectures by eminent authorities from educational institutions. It is fully realized that these contributions to the current thought on the subjects dealt with are of great value not only to those in attendance at the convention, but, through publication in the official journal, to every member of the Society.

5. That the thanks of this Society be extended to the Chilean Nitrate Committee for its grant of $600 to assist in the office administration of the

Society. This grant supplements previous grants totalling $2,200 for scholarships and other activities and emphasizes the interest which the Chilean Nitrate Committee has always taken in the work of this organization.

6. That we express to the International Education Board of New York our appreciation of their action in making a grant of $4,000 to finance a survey of agricultural research facilities in Canada and the publication of a graduate calendar based thereon. We desire to assure the Board of our co-operation in carrying out these plans to a successful conclusion because we fully appreciate the possibilities which lie behind an action of such far reaching importance.

7. As the successful operation of *Scientific Agriculture* as the publication of this Society is a matter of importance to every member, we desire to endorse the action which has been taken in extending its size and scope. In that connection, we wish to place on record our appreciation of the support of the Federal Department of Agriculture, the National Research Council, the Agricultural Colleges of Canada and the Departments of Agriculture of the Provinces of Nova Scotia, New Brunswick, Quebec, Ontario and British Columbia. As the permanence of the publication in its present form is of vital importance to the cause it serves, we would further express the hope that a continuance of this support will be forthcoming in the future.

8. That the thanks of this organization be extended to the management of the Chateau Frontenac for the efficiency of the service rendered during the Eighth Annual Convention and for the many courtesies extended beyond the usual commercial arrangements.

9. That we place on record the great sense of loss which the Society has sustained in the passing of the following members: Professor Wade Toole, Earle C. Hatch, Victor Matthews, P. C. Powys, F. G. Gale, John Fixter, George H. Hutton and C. W. Baxter. We desire that an expression of our sympathy be extended to the bereaved relatives in each case.

AN IMPORTANT CHARACTER IN STRAWBERRY VARIETY CLASSIFICATION*.

W. H. Upshall

In a study of the leaf and flower characters of strawberry varieties with special reference to identification it became apparent that one character, viz., type of pubescence on the pedicels, was of paramount importance in classification. There are two well-marked and distinct types—adpressed and outspreading, and all strawberry varieties can be assembled in either one or other of these two classes.

Outspreading	*Adpressed*
1. Aroma.	1. Belt.
2. Parson's Beauty.	2. Big Joe.
3. Portia.	3. Big Late.
4. Progressive.	4. Chesapeake.
5. Rockhill.	5. Dunlap.
6. Vanguard.	6. Gandy.
7. Williams.	7. Glen Mary.
	8. Klondike.
	9. Premier.
	10. Missionary.
	11. Sample.

The above classification, including the more important varieties of United States and Canada, has been carefully checked at the University of Maryland and the U.S.D.A. Bell Horticultural Station in 1926 and 1927, and at the Ontario Horticultural Experiment Station 1926-28 inclusive.

The pedicel is the only part of the plant on which the pubescence can be used in identification, that of the scape varying too much to be depended upon. "Adpressed pubescence" means that the hairs are lying more or less closely to the pedicel and pointing towards the inflorescence. In some varieties the hairs are not very closely pressed against the pedicel, for example, in Dunlap, but even here there is no mistaking it for the "outspreading pubescence" type since in the latter the hairs are either at right angles to the pedicel (see illustration) or pointing slightly downward as in Parson's Beauty; in other words, although the types deviate from the normal slightly it is not difficult with the naked eye to distinguish one from the other. There seems to be no true intermediate in crossing the two types.

As far as the writer is aware this character has not been recognized by horticulturists in strawberry variety descriptions even though botanists have noted it as a species or sub-species character. Observations on species at the U.S.D.A. Bell Horticultural Station indicate that *Fragaria chiloensis* usually has adpressed pubescent pedicels but one lot from Alaska was of the other type. The species *virginiana* is like *chiloensis* in that ordinarily it has the adpressed type of pubescence but in Gray's Manual there is given a variety of virginiana, *illinoensis,* which has pedicels with outspreading pubescence. The species *vesca* has been described by botanists as having ad-

*Read before the Horticulture Group of the C.S.T.A., Quebec, P.Q., June 14, 1928.

pressed pubescent pedicels. On the other hand *Fragaria moschata* appears to be of the outspreading pubescent type.

Insufficient records are available on the inheritance of type of pedicel pubescence to be certain of the dominant type.

Horticultural Experiment Station,
Vineland Station, Ont.

Types of pubescence on the pedicels of strawberry varieties.
Left, outspreading; Right, adpressed.

NOTES

SPIKE EMERGENCE IN WHEAT HYBRIDS

W. K. Smith

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In the phase of the stem rust research which is being carried on under the direction of Dr. J. B. Harrington at the University of Saskatchewan, assisted by grants from the Research Council of Canada, some observations were made on the heading of a number of wheat plants.

An F_2 population of a cross between wheats of the species *dicoccum* and *vulgare* was to be studied with respect to reaction to stem rust and morphological characters, one of which was height of plant. Of this population, the part which was susceptible to stem rust in the field was harvested when the majority of plants had headed out. Since these susceptible plants had not reached maximum growth, their height at that time could not be taken as an accurate index of the height they would attain. It is apparent, however, that about the time when the spike emerges from the leaf sheath, little further growth takes place between the crown of the plant and the top of the highest leaf sheath. It was felt that the length between these two points might be a reliable indication of the height which the plants would have attained.

Of all the resistant and partially resistant hybrids of this cross left in the nursery, all those in which the spike of the first culm had not or had just emerged from the leaf sheath on August 1, were used in this part of the study. At intervals of seven days, measurements were taken on these plants—ten in all—from the crown to the top of the highest leaf sheath and to the tip of the spike if it had emerged. Data on these ten plants are presented in the accompanying table.

Height to the top of the sheath and to the tip of the spike, along with date of heading of ten late-maturing wheat hybrids.

Plant No.	HEIGHT IN CENTIMETRES								Date of heading*
	August 1		August 8		August 15		August 18		
	to sheath	to tip	to sheath	to tip	to sheath	to tip	to sheath	to tip	
20	17	--	25.5	--	30.5	35.5	30	35.5	August 13
22	24.5	--	24.5	34.5	24	42	24	42	August 7
52	35	--	35	40.5	36	55	36	58	August 9
70	32	--	31.5	38	31.5	39	31	38	August 4
101	45	--	44.5	54	45	57	44.5	57	August 6
105	43	--	42	55.5	42.5	63	42	62.5	August 5
120	61	63	61.5	80	61.5	88	62	89	August 3
130	47	--	46.5	63.5	46.5	73	47	73	August 5
196	35	—	41.5	45	42	66	41	66	August 10
198	34	38.5	33	38	33	38	32.5	38	----------

* Date of heading—the date on which the spike emerged free from the leaf sheath.

The most significant feature brought out in the table is the fact that no growth took place between the crown and the top of the sheath after the spike began to emerge. If, then, there is a close relationship between the

height to the top of the sheath and the height to the tip of the spike, the former character can be used as a reliable indication of the total height of plant. These two heights were taken on 132 hybrids grown to maturity in the nursery and the relationship between them determined. A high correlation co-efficient ($.83 \pm .017$) was obtained.

In view of these results, on all hybrids of which the spike of the first culm had begun to emerge, the height from the crown to the top of the highest leaf sheath was used in this study as a measure of relative height. It was then possible to determine the relationship between height and the reaction to a number of forms of stem rust.

University of Saskatchewan,
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HORTICULTURE GROUP—C.S.T.A.

The annual meeting of the Horticulture group of the C.S.T.A. was held in the Parliament Buildings, Quebec, on June 14th, 1928, during the convention of the parent society. About forty members attended the meeting, at which a number of papers were read and at which two lectures were given by Dr. E. C. Auchter of the Agricultural Experiment Station, College Park, Maryland. These lectures and a number of the papers will be published in *Scientific Agriculture* as space permits.

There was some discussion as to the nature of future meetings and of the type of papers that should be presented. The general opinion seemed to favour technical or scientific papers, but there were a number who thought that there was need for more popular papers in order that a larger number of members might be interested.

The following officers were elected for the coming year:—

Chairman.....F. W. Brodrick, Agricultural College, Winnipeg.
Vice Chairman.....T. G. Bunting, Macdonald College.
Secretary.....W. R. Leslie, Experimental Station, Morden, Man.
Executive members..R. C. Palmer, Experimental Station, Summerland, B.C.; John Walker, Experimental Farm, Indian Head, Sask.; M. B. Davis, Central Experimental Farm, Ottawa, Ont.; W. S. Blair, Experimental Station, Kentville, N.S.

The next meeting of the group will be held at Winnipeg, Man. in June, 1929, at the time of the C.S.T.A. convention.

LA CLASSIFICATION DES SOLS DANS QUEBEC*

Auguste Scott

II PARTIE
UTILITE DE LA CLASSIFICATION DES SOLS POUR QUEBEC.

Si le besoin de classification des sols ne s'est pas encore fait beaucoup sentir pour nous du Québec, faut-il conclure qu'il en sera toujours ainsi? Non, loin de là, car la province de Québec, comme les autres pays, verra avant longtemps, dans la classification des sols, un moyen d'améliorer la situation du cultivateur et même de rendre service au peuple québécois.

Utilite Pour le Cultivateur de Quebec

Les données fournies par le rapport sur la classification des sols, dit Milton Whitney (*11*), seront la base fondamentale pour l'organisation du programme d'une ferme; elles feront bénéficier les générations présentes et futures.

Qu'un cultivateur change de région ou qu'un citadin veuille s'établir sur une terre; ils verront dans le rapport une aide précieuse qui les empêchera d'être exploités par qui que soit, car ce rapport leur donnera une idée précise de la valeur du sol. Veulent-ils se choisir une région avec l'intention d'y pratiquer une culture déterminée, ils verront par le rapport si la partie de terre convoitée répond bien à leur désir. Celui-ci leur dira que dans tel endroit, c'est telle culture qui est le mieux adaptée ou tel mode d'exploitation qui est en honneur; il donnera les mêmes indications, mais d'une manière beaucoup plus précise et plus complète, que donnait le Journal d'Agriculture du mois d'octobre 1927, dans son intéressant essai de carte agronomique.

Voilà pour le cultivateur émigrant, mais il n'est pas le seul à retirer des bénéfices de la classification des sols; celui qui reste attaché à la succession de ses aieux y trouvera également de précieux avantages.

Voici qu'un bon jour notre bon "Baptiste Canayen" s'apercoit qu'avec les méthodes de culture de son arrière grand-père, il ne peut réussir à rejoindre les deux bouts. Que faire s'il ne veut pas être obligé de vendre sa terre Adopter un meilleur système de culture...Mais que sera-t-il? S'il n'y a pas de classification des sols dans la région, l'agronome pourra bien lui donner de sages conseils, mais que sa besogne sera simplifiée, s'il a à mettre sous ses yeux un rapport de la classification des sols. Par ce rapport ils pourront situer la ferme en question et voir les types de sols qui la compose. Il sera alors facile de voir le point faible de cette ferme: manque d'éléments de fertilité du sol, mauvaises conditions physiques, mauvaise adaptation des plantes au sol, mauvaises cultures pour les exigences du marché, etc. En touchant ainsi du doigt le point faible, il sera facile d'y remédier. C'est ce que l'on a fait en Saskatchewan (*25*) en maints endroits et les résultats sont très probants.

Un cultivateur donné veut-il faire rendre à son sol son maximum de rendement? Un coup d'oeil sur le rapport lui indiquera les méthodes de culture qu'il doit employer. Veut-il adopter une nouvelle culture? Ce sera

*Voir Revue Agronomique, juin, 1928, pour la 1re partie de cet article.

encore le rapport qui lui dira si sa ferme est bien adaptée pour cette production spéciale.

C'est encore ce rapport qui a rendu possible en Illinois (*11*) la fondation d'écoles de fertilité du sol (soil fertility schools). Deux ou trois experts, attachés au service de classification, donnent des rendez-vous, à des dates fixes, aux cultivateurs habitant telle région déterminée. Là, pendant deux ou trois jours, ils leur montrent, le rapport de classification en main, les moyens d'améliorer leur système de culture, l'avantage qu'ils auraient d'adapter tel systême plutot que tel autre, la qualité et la quantité d'engrais à employer, etc. Ce procédé d'enseignement, dit E. E. DeTurk (*11*), a réussi à réveiller même les plus endormis.

Certes ce sont là de réels services que la classification des sols rendrait aux cultivateurs. Mais est-ce que cette classification ne pourrait faire sentir ses effets qu'à ce grand roi de son petit domaine? Non, loin de là, ces bienfaits, étant plutôt d'ordre général, les avantages que pourait en retirer le peuple du Québec ne doivent pas être négligés.

Utile Pour Le Peuple de Quebec

Pour mieux apprécier ces avantages pour la province de Québec en général, nous jetterons un rapide coup d'oeil sur son utilité au point de vue national, au point de vue colonisation, pour nous attacher davantage au point de vue agricole, puisque c'est ce dernier point qui nou intéresse le plus.

Le rapport de la classification des sols en nous donnant un aperçu si détaillé sur les conditions du sol se trouve ni plus ni moins qu'à nous faire un inventaire détaillé des ressources du pays. Il localise les cours d'eau, les chemins de fer, les routes, ou bien pour leur montrer le meilleur endroit pour l'établissement d'une voie de grande communication; en effet, le rapport montre le développement de la région, l'éloignement des autres chemins publics, il montre aussi l'emplacement des matières premières devant servir à la construction de ces routes, comme le gravier, le sable, etc.

Il nous donne aussi une idée de la condition sociale des habitants: leur richesse, leur instruction, car le rapport nous dit assez bien ce que valent les terres et la carte agronomique nous montre le site des écoles, des églises ou d'autres bâtisses d'utilité publique. En un mot, comme le dit C. B. Williams (*11*), la classification des sols sert comme référence générale.

L'industrie pourrait également retirer de précieux avantages de cette classification, car elle donnerait une description détaillée et exempte de préjugés des ressources d'une région. Les entreprises industrielles qui dépendent directement du sol (8), pour obtenir leurs matériaux bruts, comme la glaise, la pierre à chaux, la marne, etc., y trouveraient des renseignements précieux, pour la réussite de leurs affaires.

Cette classification ne pourrait-elle pas empêcher que l'on aille chercher moins de conserves à l'étranger? Voici comment...Le rapport montre que telle région particulière est très bien adaptée pour la production des tomates, du blé-d'inde, des petits fruits, comme les fraises, les bleuets—du Lac St-Jean Alors l'industriel voyant que l'établissement d'une fabrique de conserves pourrait être avantageuse, réalise son projet. Comme résultat, nous faisons consommer les produits de Québec par les gens de la province et

notre argent reste chez nous, pour améliorer la situation du cultivateur de Québec.

Les banques trouvent également de précieuses indications dans le rapport de classification, pour déterminer la valeur des terres et pouvoir se baser là-dessus, pour faire des prets aux cultivateurs. Comme le fait remarquer Charles H. Seaton (*8*), les banques trouveront dans ce rapport des renseignements précieux, quand elles voudront consentir des prêts sur certains sols de telle région.

Aux Etats-Unis, les compagnies d'assurance (*15*) se servent de la carte agronomique, pour déterminer l'état sanitaire d'une contrée, car, dit R. Harcourt (*15*), la santé et le bien-être d'un peuple sont en relation intime avec son sol: sur un tel sol on trouvera un tel degré de confort et de progrès.

Il est une question qui, dans bien des paroisses, soulèvent souvent des malentendus et même des discordes assez graves; c'est la question de l'établissement du rôle d'évaluation, pour le paiement des taxes: on se plaint toujours que l'on est évalué trop haut. Avec la classification des sols cette difficulté serait pratiquement comblée, car les terres des différents types de sol d'une même paroisse auraient chacune leur valeur respective. Il ne resterait plus aux évaluateurs qu'à déterminer la valeur des bâtisses ; la chose serait beaucoup plus facile et plus vite faite. Le professeur Hansen (*25*) trouve que ce système promet de très bons résultats, pour la taxation des terres de la Saskatchewan.

Un autre point de vue qu'il ne faut pas négliger, c'est le point de vue colonisation. Voici ce que M. R. A. Valin, Ingénieur Forestier, nous écrivait en avril 1927: "C'est elle.....la classification des sols au point de vue colonisation.....qui est à la base du succès ou de l'insuccès agricole, parce que, si par elle l'on donne à l'agriculture des terrains plus propres en général à la production du bois qu'à celle des produits agricoles, il devient alors impossible de les cultiver profitablement". En effet, la classification des sols nous donnera une idée précise de la valeur du sol et de son développement possible dans le futur. Il est nécessaire, dit Hugh H. Bennett (*11*), pour notre bien-être et celui des enfants de nos enfants de ne pas défricher des terres qui conviendraient davantage pour la forêt. Hélas nous avons bien des exemples dans Québec du défrichement de terres qui ne peuvent plus faire vivre leur propriétaire, maintenant qu'elles sont déboisées: Que de terres sont rendues aujourd'hui absolument improductives faute de classification! Maintenant qu'elles ne contiennent plus de bois leur extrême pauvreté fait qu'elles ne poussent pratiquement plus rien. Voici ce qu'en pense M. Charles Gagné, professeur d'Economie, à l'Ecole d'Agriculture de Ste-Anne de la Pocatière: "Est-ce que défricher des terres sablonneuses ou ramasser des cailloux sont des travaux directement productifs? Au Congrès de Colonisation, tenu à Québec, en décembre dernier, nous avons entendu plussieurs patriotes protester avec véhémence contre l'assertion que certaines paroisses, ouvertes au défrichement, étaient impropres à la culture. Ces protestations éloquentes oubliaient presque toutes de prouver que ces paroisses étaient avantageuses à coloniser. La classification des sols s'impose dans notre province (*23*)."

Comme résultat qu'est-ce qu'il arrive? Ces terres, après avoir exigé une somme énorme de travail, sont abondonnées et toute l'énergie dépensée reste là improductive. Et le propriéétaire, que fait-il? Il se décourage, abondonne la terre pour la ville, quand il ne va pas s'exiler sur un territoire étranger. Plusieurs fermes du Michigan, dit M.M. McCool (*11*), ont été abandonnées durant ces dernières années; la classification de ces sols nous a montré que toutes ces fermes appartenaient à des sols classés comme improductifs ou peu productifs.

C'est une bonne chose d'avoir une idée de la qualité du sol, mais c'est encore une chose plus précieuse d'en connaître aussi leurs limites. C'est là une très bonne indication au point de vue colonisation. Il peut arriver, en effet, qu'en un endroit donné, il y ait des terres très fertiles, mais en quantités restreintes et entourées d'autres terres pratiquement incultes. Devrait-on défricher ces terres? Certes non, car les deux ou trois propriétaires de ces sols fertiles pourront bien avoir de belles récoltes, mais dans quelle situation sociale se trouveront-ils? Entourés de forêts ou de malheureux colons qui ont vu s'écrouler avec chaque arbre une parcelle de leur espoir déçu. Avec celà, s'ils ne sont pas situés sur une ligne de chemin de fer, on peut se faire une petite idée des voies de communication qu'ils auront.

S'agit-il de fonder une nouvelle région; la classification servira de guide pour choisir les meilleures terres d'abord, pour prendre ensuite les moins bonnes, lorsque les conditions se seront quelque peu améliorées. De même le colon, en ayant une idée plus exacte du fond de la terre, pourra choisir une région où le sol conviendra le mieux à ses aspirations futures.

En plus de ces facteurs qui regardent directement le sol, la classification peut lui donner d'autres indications qui affecteront grandement la valeur des terres. Ainsi elle montrera les voies de communication par terre ou par eau, les marchés et les conditions sociales de la région, etc; cela tout en donnant une idée du climat, de la topographie, de la population, etc.

Toutes ces indications contribueront à améliorer cette état de chose que déplorait Thos. D. Rice (*11*): "Ceux de nous qui ont travaillé à la classification des sols ont pu voir les luttes pénibles de plus d'un pionnier, qui ont dépensé les plus belles années de leur vie sur un sol improductif, tandis qu'il y avait tout près d'eux des sols fertiles qu'ils auraient pu aussi bien avoir".

Ces différents points de vue méritent certainement d'être étudiés, mais la question principale pour nous, c'est à n'en pas douter le point de vue agricole. M. J.H. Lavoie, lors d'une conférence prononcée à l'exposition de St-Jean-Port-Joli, le 21 septembre 1927, disait aux cultivateurs qu'ils devaient s'efforcer de mettre sur le marché des produits uniformes. Pour celà, dit-il, efforcez-vous davantage de spécialiser votre production; au lieu d'envoyer vos fils au loin dans des régions nouvelles, divisez vos fermes, pour pratiquer une culture plus intense. Ceci serait certainement très avantageux surtout pour les endroits rapprochés des grands centres, comme par exemple, les comtés environnant Montréal. Mais avant cela unè autre chose s'impose, c'est la classification des sols. Quand on aura bien déterminé

quelle culture sera produite de préférence sur tel sol, c'est là qu'on pourra pousser davantage la culture spécialisée, sans courir le risque de subir des échecs lamentables qui décourageront bon nombre des cultivateurs qui auront pris les devants.

La classification des sols, dit le professeur R. Harcourt nous fournit *(15)* un inventaire complet de nos sols et doit apporter la même relation en ce qui regarde nos ressources du sol que l'enquête géologique nous en apporte en ce qui regarde nos ressources minérales. En effet, la classification des sols nous donne un rapport détaillé des différents sols; entre autres informations, elle nous donne une idée précise des différentes propriétés de chaque sol.

Les autres conditions étant égales, la productivité d'un sol dépend de deux facteurs principaux:

1)—Les caractères physiques du sol.

2)—Ses propriétés chimiques.

Qu'est-ce que nous dit la classification des sols au sujet de ces deux facteurs? Considérons d'abord les caractéristiques physiques. Par l'analyse mécanique, nous connaissons la grosseur des particules qui joue un rôle si important sur la productivité d'un sol. Les récoltes que l'on voit sur un sol sablonneux et sur un sol argileux qui souvent possèdent à peu près les même principes fertilisants, en sont une preuve bien palpable.

Une autre condition non moins importante, c'est l'égouttement du sol. Le rapport de classification nous donne encore une idée précise sur cet item: d'abord la grosseur des particules a son rôle à jouer là-dessus, mais le principal facteur est certainement le drainage des terres, facteur qu'indique bien le rapport de classification des sols.

La topographie y joue aussi un certain rôle; un sol très accidenté sera plus lavé par les eaux et par conséquent les éléments nutritifs de la plante les plus solubles auront tendance à s'épuiser plus rapidement. Dans certains cas même les accidents de terrain pourront empêcher la culture d'une terre qui par ailleurs serait très productive. Ce facteur, topographie, est encore très bien indiqué dans le rapport de classification des sols.

La composition chimique du sol est également très bien déterminée dans la classification des sols. L'analyse chimique du sol nous donne d'abord la quantité totale d'éléments essentiels à la plante. Mais ce n'est pas tout de savoir si tel sol contient les éléments requis par la plante, il faut aussi savoir si celle-ci peut se les approprier. L'aspect de la végétation donné dans le rapport de classification, complètera ces données de l'analyse chimique, en nous montrant le degré d'assimilation des éléments du sol.

Si on rapproche ensuite ces résultats des données que l'on a sur les procédés de formation du sol et sur la nature des éléments qui ont servi à le constituer, on est passablement en mesure d'en connaitre exactement la valeur productive.

Une fois que l'on connait d'une façon aussi précise ces différentes propriétés, il est alors beaucoup plus facile de faire des expériences qui pourront être valables pour tous les sols du même type. La grande valeur du rapport, dit R. Harcourt *(15)*, repose dans ce fait qu'il forme la base des études pratiques et systématiques des problèmes du sol.

En effet, par ce rapport, on peut tirer de meilleures conclusions des expériences faites sur les différents champs de démonstration; on peut même au besoin en établir de nouveaux sur les types de sol qui exigent plus de travaux expérimentaux. Toutes les expériences que l'on fait sur ces différents champs sont certainement très utiles, mais leurs résultats peuvent-ils indifféremment s'appliquer à toute une région? Certainement non, car elles sont rares les régions qui possèdent toutes le même sol. Si les expériences sont faites sur une terre argileuse, les résultats pourront bien difficilement s'appliquer à une autre qui est sablonneuse; ceci passe encore, puisque ces expériences valent pour les terrains argileux, mais si les expériences se poursuivent en des endroits constitués de terres très variables, quelle application pourrait-on en faire, sur les fermes constituées du même type de sol?

Si, au contraire, on a une bonne classification, on saura que ces champs sont établis sur tel type de sol et que leurs données ne valent que pour ces mêmes types. Ces expériences ainsi faites nous diront d'une façon précise la quantité et la qualité d'engrais chimiques ou de ferme la plus propice à chacun d'eux; elles nous montreront le système de culture le plus avantageux, la possibilité de réussite de telle ou telle culture spécialisée, les cultures répondant mieux aux conditions du marché, etc.

Mais dira-t-on, qu'est-ce que feront ceux qui habitent d'autres types de sols? Il ne s'agira que d'y établir de nouveaux champs de démonstration. Les champs qui sont situés sur des sols très variés ou qui sont en nombres multiples sur un même type de sol pourront être changés de place et établis sur les types qui n'en possèdent pas.

Comme la classification indique l'importance des différents types de sol, on pourrait alors facilement déterminer l'importance des différents champs de démonstration, d'après l'importance du type de sol sur lequel ils sont situés. Au lieu d'avoir deux ou trois champs de grande importance, on n'en aura qu'un pour le type principal de sol, et les autres d'importance secondaire seront pour les autres types de sol de moindre importance.

Les expériences que l'on fera alors sur l'adaptabilité des récoltes seront beaucoup plus justes. On sait que le degré de succès de l'exploitation agricole est en proportion directe des connaissances pratiques que possède le propriétaire sur l'adaptabilité des récoltes au sol. Quand bien même un cultivateur aurait les plus grandes connaissances agronomiques possibles, soit théoriques, soit pratiques, il ne réussira jamais à faire pousser avantageusement les légumineuses en terrain acide et les pommes de terre en sol très lourd ou fortement alcalin. Aussi, dit Charles H. Seaton (*8*), il existe une relation définie entre le sol et la qualité et la quantité des plantes produites. La classification des sols, dit L. F. Gieseker (*20*), nous a rendu de grands services en montrant l'adaptabilité de certaines aires, pour la production de certaines récoltes et empêcher la répétition des désastres qui se sont produits sur certaines terres pauvres. Une parfaite connaissance de nos sols, dit Milton Whitney *(11)*, rend possible un ou plusieurs systèmes de cultures dans lesquels une rotation rationnelle peut être adaptée.

Une connaissance si exacte de nos sols, avec les données expérimentales que l'on aurait sur l'adaptabilité des récoltes de chaque type de sol, seraient

à n'en pas douter, d'une très grande utilité, pour l'étude des sols dans nos différentes institutions agricoles. L'étude des sols, pour nous du Québec, perd beaucoup d'intérêt et surtout d'utilité, par le fait que l'on ne peut avoir de données précises sur ceux-ci. On peut dire seulement d'une façon générale les caractéristiques principales de nos sols: manque de chaux et d'acide phosphorique. Combien il serait plus intéressant, si on pouvait dire que dans tel comté, les sols sont pauvres en tel élément, que dans tel autre, on devrait adopter tel système de culture. Sans compter le bien que celà pourrait rendre au cultivateur, les étudiants venant de cette région déterminée pourraient étudier davantage les types de sols qu'ils habitent et être plus en état de faire face aux différents problèmes qu'ils comportent.

Dans l'Etat de Ohio (*11*), on exige des élèves qui veulent obtenir leur degré de B. Sc., dans le Collège d'Agriculture de l'Etat, un échantillon de sol venant de la ferme paternelle. On lui fournit les indications nécessaires, pour la prise de cet échantillon qui lui servira dans ses travaux de laboratoire sur les sols. On lui fait faire tous les travaux nécessaires à la classification et on lui fait localiser sur la carte le type de sol qu'il a trouvé. Cela permet, dit Firmin E. Bear (*11*), d'abord à l'élève de se familiariser avec les travaux de classification, mais surtout d'augmenter de beaucoup l'intérêt de l'étudiant dans ses différents travaux. Dans l'Etat de Géorgie, on pratique la même méthode de faire classifier par l'étudiant les sols de chez lui. On rend ainsi, dit M.W. Lowry (*19*), l'étude des sols plus intéressante et plus profitable. Le professeur R. Harcourt (*15*), conseille également aux "High Schools" et aux Collèges d'Agriculture de se servir de la classification des sols dans l'étude des différents problèmes d'économie rurale.

Pour résumer nous pourrons dire avec le professeur Hansen de Saskatchewan (*25*): "La classification des sols est une chose fondamentale. Pourquoi le fermier n'en connaitrait-il pas aussi long sur son sol qu'il en connait sur les animaux et la mécanique? Si le développement et la prospérité dépendent du sol, il faut absolument le connaitre."

Mais dira-t-on, si cette utilité se démontre très bien en théorie, apparaitrait-elle aussi clairement dans la pratique ? Grâce à la bienveillante coopération de M. Auguste Pepin Ph.D., nous pourrons répondre à cette objection, en montrant les résultats d'une enquête faite par celui-ci dans l'Etat de New-York, en novembre 1921. Il envoya aux agronomes de l'Etat une lettre circulaire leur demandant ce qu'ils pensaient de la classification des sols.

Voici ce qui lui a été répondu:

Opinions D'Agronomes de L'Etat de New-York sur la Classification des Sols.

1) *L. M. Allen, Lockport:*

In reply wish to advise that during the three years I have been in the Farm Bureau work, I have had little occasion to use a soil survey map. It is a question in my mind whether it is worth the expenditure of the money to make one.

2) *F. R. Walkley, Wampsville:*

We have a soil map of our county hanging in the office but can not say that we have used it a great deal. Occasionally it is used when some man outside the state makes inquiries regarding types of soils in Madison County.

3) *Ray F. Pollard, Cobleskill:*

We think very well of the soil surveys. The map is a very valuable guide to prospective purchasers of farms.

4) *M. D. Butler, Cortland:*

I would like to suggest that for my use a soil survey map has been of a great deal of assistance to me in one way or another. However from the standpoint of the practical farmer I think the maps have but little value.

5) *G. W. Bush, Utica:*

The soil survey of Oneida County was made some time ago by Prof. E. O. Fippin, and contains information that can be found in no other place. Our supply of these has been exhausted. The principal calls we have had for them are from men in the western part of the United States, who desire to buy farms in the county.

I consider this valuable information for county agents, though, frankly, we have not yet had the opportunity to study it in as close detail as perhaps we should.

6) *F. H. Lacy, Poughkeepsie:*

Replying to your favor regarding soil surveys I will say that a survey was made of Dutchess County several years ago. I had never until now endeavored to analyze the use that I make of the information which the map contains. I believe, however, that a general knowledge of the soil characters in the territory is essential for a county agent to do his best work. Such a knowledge could be obtained after a considerable period of years by personal observation but most county agents do not continue in the same county very many years and even though they did it would take them some time at the outset to learn the soil types and conditions.

In a circumstance where the county agent was doing considerable general advising from his office or attempting to launch a campaign for the growing of any new crop or advising in regard to use of lime, fertilizer, etc., it would be very necessary for him in some way to have some real knowledge in regard to the various soils in the area over which he was working. In case he was not able to make this detailed study himself a survey should be very helpful, in fact might be fundamental.

Dutchess County is to a considerable extent a fruit county. If a man came to me for advice in regard to planting fruit and showed me where his farm was located on the map or told me what soil type he was on I would be in much better position to advise him than if I was not familiar with his soil.

I believe that the survey is generally helpful and worth while, particularly since it is a permanent piece of work that can stand for all time and will not require doing over again provided it is well done in the first place. Like many other things I consider that it is not indispensible but very helpful.

Given a basic knowledge of the original soil, of course farm practice and conditions modify matters to a very considerable extent. In the soil survey of Duchess County more soil types are recognized than have to my mind any practical value. The essential things to know are the general character of the soil and something in regard to its texture and drainage and elevation. We do not need to define eight or ten different kinds of sandy loam, for example, as for practical purposes to my mind they are almost identical.

7) *L. D. Greene, Middletown:*

I take pleasure in advising you that I deem that they (soil surveys) are a great advantage not only to the County Agricultural Agents but the farmers in the county. In fact so much so that some time ago I wrote the Soil Survey Department at Washington and requested that all of the soil survey maps which they had on file covering Orange County be forwarded to this office for distribution. It has been of great value to me to have this map in the office, both on exhibit and for distribution, to men from outside the county who were planning on purchasing property within the county, as it has given them the general location of land which they deem most desirable for their needs. I think that soil survey maps are worth all they cost.

8) *William I. Row, Watertown:*

I have found that soil survey maps have been of much assistance to me in a number of instances. Our county is large and during the first two or three years I was in the county I had occasion to refer to the soil survey map in answering inquiries and in working our community programs.

We find that in counties such as ours where the soil types change and vary even in a ten acre field, it is of distinct advantage to have at hand some readily obtainable information as to what these types are. It has frequently happened that recommendations made after talking a matter over with the farmer would be found impractical after consulting the soil survey, thus saving not only unnecessary trouble but expense to the farmer as well. I have also found that soil survey maps of other counties are of value not only while working in them but also in counties where work is being carried on in which we are interested.

Conclusion

Si la plus grande majorité des pays du monde ont senti le besoin d'une classification des sols, si la plupart des provinces du Dominion ont jugé utile la classification de leur sol, si d'autre part l'on reconnait l'utilité que pourrait avoir la classification des sols pour le Québec et l'habitant québécois, si tous ceux qui se sont occupés de la question, soit théoriquement soit pratiquement, sont unanimes à constater ses grands avantages, est-ce que cette classification des sols ne mériterait pas d'être tentée dans la province de Québec?

Certes oui, mais comme c'est un travail dispendieux et de très longue portée, il faudrait l'assoir sur des bases solides. D'abord la chose principale qui s'impose, c'est d'avoir de bons spécialistes en la matière. Nous avons l'exemple de l'Ontario (*15*) qui a vu son travail péricliter et piétiner sur place tant que W. L. Iveson, spécialiste en la matière, n'a pas pris la direction du travail pour le faire avancer rapidement. Une autre condition qui s'impose,

c'est de ne pas aller trop vite, ni d'embrasser trop grand. Le travail qui s'imposerait pour le moment dans Québec, ce serait une classification sommaire, du moins dans la plupart des cas.

Mais si cette classification s'impose où devrait-on l'inaugurer? A notre avis, ce serait certainement dans les endroits où le besoin s'en fait le plus sentir, c'est-à-dire là où les rendements du sol sont plutôt réduits. Ce pourrait être, par exemple, dans certains endroits de colonisation où le sol est plutôt pauvre et demande une attention particulière, pour pouvoir faire vivre son propriétaire. En agissant ainsi, il serait plus facile de faire toucher du doigt les avantages de la classification, car le mal étant plus grand il serait plus facile de faire voir les bons effets réalisés. Les gens, pouvant ainsi constater facilement les bienfaits de cette classification, lui seront très favorables et pourront, comme en Saskatchewan (33), exercer une pression auprès des autorités gouvernementales, pour tâcher de faire marcher plus rondement le travail commencé et le demander là où il n'existe pas.

Avec ce système de classification, le peuple du Québec connaîtra beaucoup mieux les ressources naturelles et industrielles de son pays; ce qui lui permettra de mieux apprécier sa belle province de Québec. Le colon sera conduit sur des terres qui pourront le faire vivre, même en ne contenant plus de bois. Ainsi on verra la misère déserter le foyer du cultivateur et du colon, emportant dans son sein la néfaste envie de passer le 45°, pour quitter "ce sol béni qu'ont habité nos ancêtres, qu'ils on conquis et colonisé et qu'ils ont fécondé de leurs sueurs et de leur sang". En effet, la bonne terre québécoise cultivée d'une façon méthodique saura faire sortir de son sein la moisson dorée qui fait la joie et le bonheur de l'homme des champs.

Remerciements

Nous devons remercier sincèrement pour l'aide qu'ils nous ont fourni, nos dévoués directeur et professeurs, particulièrement M. L'Abbé Amédée Giasson, l'Honorable Albert Préfontaine, Ministre de l'Agriculture et de la Colonisation, Manitoba, M. AugustePépin Ph.D., M. Epiphane Thériault, Directeur de l'Ecole de Laiterie, St-Hyacinthe et M. G. E. Michaud, agronome de Prince-Albert, Saskatchewan.

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Note

Les lecteurs de la Revue agronomique n'auront pas été sans remarquer les fautes typographiques restées dans le texte du discours présidentiel prononcé par le Dr. L. Ph. Roy à la Convention de Québec, paru dans le numéro de juillet de notre Revue.

Par suite d'un malentendu, nous n'avons pas reçu les épreuves de ce travail, et elles ont donc été sous presse sans subir les corrections nécessaires. Nous tenons à exprimer nos regrets à ce sujet.

Note personnelle.

Le 18 juillet, a eu lieu la bénédiction du mariage de notre confrère Aimé Gagnon, professeur à l'Institut Agricole d'Oka, avec mademoiselle Poissant, de St-Philippe de Laprairie. A cette occasion, la Section de Montréal de la C. S. T. A. organisa une fête intime, le samedi 14 juillet, au Cercle Universitaire, en l'honneur du futur épousé, qui réunit plus de vingt-cinq amis de celui-ci.

CONCERNING THE C.S.T.A.

Notes and News

J. H. Craigie (Harvard '24) has been appointed Head of the Cereal Division, Dominion Rust Research Laboratory, Winnipeg, replacing Dr. D. L. Bailey (Queens '18) who resigned recently to become Professor of Plant Pathology at Toronto University.

E. B. Fraser (British Columbia '25) who is at the Iowa State College taking graduate work towards his M.Sc. degree, has received the appointment of Animal Husbandman under the Dominion Experimental Farms Branch with headquarters at the Central Experimental Farm, Ottawa, Ont.

E. G. Booth (Saskatchewan '21) recently received his Ph.D. degree from the University of Minnesota. He is Extension Agronomist at the Agricultural College, Fargo, North Dakota, U.S.A.

F. F. McKenzie (British Columbia '21) who has been Director and Professor of Agriculture at the Internation College, Smyrna, Turkey, for the last year has returned to the University of Missouri to take up Animal Breeding Research as a member of resident staff. His address is Animal Husbandry Department, University of Missouri, Columbia, Mo.

H. M. Tysdal (Saskatchewan '24) who has been in Sweden studying plant breeding and plant physiology under an American-Scandinavian Foundation Fellowship which he was awarded last year, has joined the Department of Agronomy, Agricultural Experiment Station, Lincoln, Nebraska, U.S.A.

W. K. Smith (Aberdeen '23) who has recently been Assistant in the Field Husbandry Department, at the University of Saskatchewan, has accepted a fellowship in plant breeding in the Department of Agronomy, State College, Pullman, Wash., U.S.A., and will continue his post graduate work there.

John Percival Spittall (McGill '23), Assistant Entomologist in the Dominion Entomological Laboratory at Annapolis Royal, N.S., died at Halifax on July 9th. He was born in England in 1888.

A graduate fellowship in Vegetable crops is available at the Iowa State College. The position pays $800 for half time per calendar year, with the privilege of taking graduate work and utilizing one of the Station projects for this purpose. As this vacancy should be filled shortly after August 1st, any interested members of the C.S.T.A. should communicate at once with Mr. A. T. Erwin, Chief, Vegetable Crops Section, Iowa State College, Ames, Iowa, U.S.A.

The General Secretary has on hand several copies of the report of the Saskatchewan Overseas Livestock Marketing Commission, which spent three months of last year on an investigation relative to the marketing of Saskatchewan livestock. The commission consisted of Dr. W. W. Swanson, Mr. R. A. Wright, Mr. Edward Evans, Mr. P. J. Hoffman and Mr. W. Waldron. The report, together with a bulletin containing important extracts from the report, can be obtained from the General Secretary, or by writing direct to Mr. W. Waldron, Co-operation and Markets Commissioner, Department of Agriculture, Regina, Sask.

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